

# **EXHIBIT B**

<p style="text-align: right;">Page 1</p> <p>1 UNITED STATES DISTRICT COURT DISTRICT OF NEW JERSEY</p> <p>2 ----- X</p> <p>3 IN RE: VALSARTAN, LOSARTAN, AND : MDL NO. 2875 IRBESARTAN PRODUCTS LIABILITY : LITIGATION, : 4 : THIS DOCUMENT RELATES TO: : 5 Duffy, et al. v. Solco Healthcare : U.S., L.L.C., et al., : 6 Case No. 1:18-cv-15076-RBK-JS : ----- X</p> <p>7 8 9 ***RESTRICTED CONFIDENTIAL***</p> <p>10 11 12 Veritext Virtual Zoom Videotaped 13 deposition of MAHYAR ETMINAN, Ph.D., taken on 14 Tuesday, August 24, 2021, held in Vancouver, City of 15 British Columbia, Canada, commencing at 8:00 a.m., 16 before Jamie I. Moskowitz, a Certified Court 17 Reporter and Certified Livenote Reporter.</p> <p>18 19 20 21 22 23 24 25</p>	<p style="text-align: right;">Page 3</p> <p>1 A P P E A R A N C E S: (All appearances via Zoom)</p> <p>2</p> <p>3 GREENBERG TRAURIG BY: STEPHEN T. FOWLER, ESQUIRE 4 2101 L Street, N.W. - Suite 1000 Washington, DC 20037 5 202.331.3100 fowlerst@gtlaw.com 6 Counsel for Defendant Teva Pharmaceuticals Industries Ltd.</p> <p>7</p> <p>8 GREENBERG TRAURIG BY: STEVEN M. HARKINS, ESQUIRE 9 Terminus 200 3333 Piedmont Road NE - Suite 2500 10 Atlanta, Georgia 30305 678.553.2100 11 harkinss@gtlaw.com Counsel for Defendant Teva Pharmaceuticals 12 Industries Ltd.</p> <p>13</p> <p>14 HILL WALLACK LLP BY: NAKUL Y. SHAH, ESQUIRE 21 Roszel Road 15 Princeton, New Jersey 08540 609.924.0808 16 nshah@hillwallack.com Counsel for the Defendants Hetero Drugs and Hetero 17 Labs</p> <p>18</p> <p>19 PIETRAGALLO GORDON ALFANO BOSICK &amp; RASPANTI, LLP BY: JASON M. REEFER, ESQUIRE BY: CLEM C. TRISCHLER, ESQUIRE 20 One Oxford Centre 301 Grant Street -- Floor 38 21 Pittsburgh, Pennsylvania 15219 412.263.2000 22 jmr@pietragallos.com Counsel for the Defendant Mylan</p> <p>23 24 25</p>
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<p>Page 9</p> <p>1 TABLE OF CONTENTS</p> <p>2 MAHYAR ETMINAN</p> <p>3</p> <p>4 Examination</p> <p>5 By Mr. Gallagher.....Page 11</p> <p>6 Notice to Read &amp; Sign.....Page 274</p> <p>7 Reporter Certificate.....Page 276</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>	<p>Page 11</p> <p>1 objections, please state them now.</p> <p>2 * * *</p> <p>3 MAHYAR ETMINAN, after having been</p> <p>4 first duly sworn, was examined and testified as</p> <p>5 follows:</p> <p>6 * * *</p> <p>7 THE COURT REPORTER: Okay, please</p> <p>8 proceed.</p> <p>9 EXAMINATION BY MR. GALLAGHER:</p> <p>10 Q Good morning, Dr. Etminan. You can</p> <p>11 put your hand down now.</p> <p>12 A Good morning.</p> <p>13 Q My name is Patrick Gallagher. I'm</p> <p>14 with the law firm of Duane Morris. I represent some</p> <p>15 of the defendants in this matter, and I'll be asking</p> <p>16 you a series of questions today for your deposition.</p> <p>17 Can you please state your name for the record?</p> <p>18 A Mahyar Etminan.</p> <p>19 Q Dr. Etminan, have you ever been</p> <p>20 deposed before?</p> <p>21 A Yes.</p> <p>22 Q How many times?</p> <p>23 A Just off the top of my head, at least</p> <p>24 four or five times.</p> <p>25 Q Okay. When did you first speak with</p>
<p>Page 10</p> <p>1 THE VIDEOGRAPHER: We are going on the</p> <p>2 record at 8 a.m. on August 24th, 2021. This is</p> <p>3 Media Unit Number 1 of the video recorded</p> <p>4 deposition of Mahyar Etminan in regards to the</p> <p>5 valsartan, losartan litigation.</p> <p>6 My name's Justin Bily from the firm</p> <p>7 Veritext and I am the videographer. The court</p> <p>8 reporter is Jamie Moskowitz from the firm</p> <p>9 Veritext. All counsel will be noted on the</p> <p>10 stenographic record. Will the court reporter</p> <p>11 please swear in witness and then we can begin.</p> <p>12 * * *</p> <p>13 PROCEEDINGS</p> <p>14 THE COURT REPORTER: The attorneys</p> <p>15 participating in this deposition acknowledge</p> <p>16 that I am not physically present in the</p> <p>17 deposition room and that I will be reporting</p> <p>18 this deposition remotely.</p> <p>19 They further acknowledge that, in lieu</p> <p>20 of an oath administered in person, the witness</p> <p>21 will verbally declare his testimony in this</p> <p>22 matter is under penalty of perjury.</p> <p>23 The parties and their counsel consent</p> <p>24 to this arrangement and waive any objections to</p> <p>25 this manner of reporting. If there are any</p>	<p>Page 12</p> <p>1 plaintiffs' counsel with respect to this case?</p> <p>2 A Again, to the best of my recollection,</p> <p>3 I believe it was probably in late spring, maybe</p> <p>4 April or May.</p> <p>5 Q Okay. And who was that counsel that</p> <p>6 you first spoke to about this case?</p> <p>7 A Again, it was either Mr. Nigh or</p> <p>8 Ms. -- I forget her last name. Rosemarie.</p> <p>9 Q Okay.</p> <p>10 A I don't -- I'm not sure exactly which</p> <p>11 one posed the question, but they both approached me.</p> <p>12 Q Okay. And have you ever spoken to</p> <p>13 either -- either Mr. Nigh or Rosemarie prior to</p> <p>14 speaking to them about this case?</p> <p>15 A I did some work for them on a</p> <p>16 different litigation as well.</p> <p>17 Q Did you serve as a testifying expert?</p> <p>18 MR. NIGH: Hold on. Don't answer that</p> <p>19 question. We have not disclosed experts in</p> <p>20 Zantac, so I'm not going to allow him to answer</p> <p>21 any more questions about the Zantac litigation.</p> <p>22 MR. GALLAGHER: Okay.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q Other than this case, have you had</p> <p>25 other -- strike that.</p>

<p style="text-align: right;">Page 13</p> <p>1 Have you spoken to any other experts 2 involved in this case, the valsartan litigation? 3 A No. 4 Q Okay. Have you reviewed any -- have 5 you reviewed any expert reports of other experts 6 with respect to this litigation? 7 A Yes, I have reviewed Dr. Prizing, I 8 believe, and their reports. 9 Q Okay. 10 MR. GALLAGHER: Can we mark the first 11 exhibit Exhibit 1? It's the deposition notice. 12 (Whereupon, Exhibit 1 was marked for 13 Identification.) 14 MS. APPEL: It's already marked. 15 BY MR. GALLAGHER: 16 Q Dr. Etminan, have you seen this 17 document before? 18 A Yes. 19 MR. GALLAGHER: And if we go to the -- 20 I think it's on the next page, next page. 21 BY MR. GALLAGHER: 22 Q Have you -- did you review this? 23 MR. GALLAGHER: Then we can skip ahead 24 to the next page. 25 THE WITNESS: Yes, I have.</p>	<p style="text-align: right;">Page 15</p> <p>1 articles you were going include and provide? 2 A Again, the articles where I talked 3 about extensively in the report, that contribute 4 substantially to the weight of the evidence, I have 5 included all of those articles. 6 Q Okay. Did you have like a file of 7 these articles, or was -- were you -- 8 A Well, I had -- 9 MR. NIGH: Form. Objection. 10 THE WITNESS: I -- I -- my report is 11 mainly a systematic review of the literature. 12 So when I did my systematic review, I found 13 articles that met the selection criteria in 14 that review. So I went ahead and completed the 15 report. And when I received this request, I 16 went back and looked at all the -- the main 17 articles or studies that I have included. And 18 I went about selecting them again, using mainly 19 the criteria in my research, in my search and 20 also the weight of the evidence that they 21 contributed to the report. 22 BY MR. GALLAGHER: 23 Q So I think that -- the documents 24 that -- or the articles -- strike that. 25 The articles that you provided in</p>
<p style="text-align: right;">Page 14</p> <p>1 BY MR. GALLAGHER: 2 Q Do you see there's a series of 3 requests for certain documents? Did you -- did you 4 collect documents to -- to be produced in response 5 to these requests? 6 A Yes. 7 MR. NIGH: And for the record, we did 8 serve response to his requests on defense 9 counsel more than 48 hours prior to this 10 deposition. 11 MR. GALLAGHER: We did receive -- 12 receive those documents. 13 BY MR. GALLAGHER: 14 Q How did you go about collecting the 15 documents that you provided in response to these 16 requests? 17 A I provided all documents, pertinent 18 studies that I used to formulate an opinion in my 19 expert report, including my search strategy and, 20 again, the articles that I found that sort of 21 contributed to the weight of the evidence that I 22 used in my report. 23 Q Okay. And with respect to the 24 articles that you provided in response to the 25 request, how did you -- how did you decide what</p>	<p style="text-align: right;">Page 16</p> <p>1 response to these requests, include some of the 2 articles and papers that are cited in your report 3 but not all of the articles and papers that are 4 cited in your report. 5 MR. NIGH: Hold on, Doctor. Doctor, 6 hold on. Hold on. If you can, let Patrick 7 finish his question. I know it may be a little 8 difficult because it sometimes does sound like 9 he trails off at the end. But at the same 10 point, I need a pause in between his question 11 and your answer, so I that I can, you know, 12 interject an objection if I -- if I need to. 13 So here, I'm going to object to form. 14 Go ahead, you can answer, Doctor. 15 THE WITNESS: Yeah, so if there were 16 citations in the report where I only looked at 17 the abstract of the paper and not really 18 included the body of the paper because I didn't 19 need to, those articles are just cited in my 20 report. But I provided the articles that 21 actually contributed to the weight of the 22 evidence and my opinions in the report. 23 BY MR. GALLAGHER: 24 Q So would it be fair to say, then, that 25 articles that are cited -- that may be cited in your</p>

<p style="text-align: right;">Page 17</p> <p>1 report but that you did not provide in response to  2 these requests did not contribute to your opinions  3 in this matter?  4 MR. NIGH: Form. Objection.  5 Misstates his testimony.  6 You can answer.  7 THE WITNESS: No, they do. Again,  8 if -- if there was -- if there were statements  9 that I made that are general statements that  10 are -- that are sort of known facts, I, you  11 know, didn't really provide those specific  12 articles. But I cite them. I provided  13 articles where I, you know, make a lot of  14 discussions around the weight of the evidence  15 provided in those articles.  16 BY MR. GALLAGHER:  17 Q Okay. Let's move on and mark as  18 Exhibit 2 your CV.  19 (Whereupon, Exhibit 2 was marked for  20 Identification.)  21 THE WITNESS: Sorry. Is this going to  22 be a document upload or is it --  23 BY MR. GALLAGHER:  24 Q It is.  25 A I'm still waiting.</p>	<p style="text-align: right;">Page 19</p> <p>1 focus on causal inference to pharmacy students. I  2 also teach a similar lecture to graduate students in  3 the department of ophthalmology. And another  4 pharmacy course on evidence-based medicine, with --  5 one is undergraduate, and one is for the pharmacy  6 residents who have graduated. But it's two  7 different courses but same sort of topic:  8 evidence-based medicine.  9 Q Okay. And I believe you mentioned in  10 the 30 to 40 percent, you said teaching and  11 graduate, undergraduate training. Is there any  12 aspect of graduate or undergraduate training you're  13 referring to other than the courses you teach?  14 A Right. So I teach undergraduate  15 medical students, and it's more of a -- sort of a  16 research rotation, if you will, that they have. So  17 they spend six to eight weeks reading up on  18 epidemiological methodology and taking on a project.  19 I do some -- the same sort of research teaching as  20 well to ophthalmology residents.  21 And then I have also graduate students  22 who are enrolled in a master's or a Ph.D. program  23 through the Department of Experimental Medicine, and  24 I supervise them on sort of a more regular basis  25 because they're -- you know, they're graduate</p>
<p style="text-align: right;">Page 18</p> <p>1 MR. NIGH: Yeah, we don't have it yet.  2 There it is. Do you have it, Doctor?  3 THE WITNESS: I got it, yeah.  4 BY MR. GALLAGHER:  5 Q So Dr. Etminan, you're an associate  6 professor in the Department of Ophthalmology and  7 Visual Sciences; is that correct?  8 A That's right.  9 Q At the University of British Columbia,  10 correct?  11 A Correct.  12 Q What does that position entail?  13 A The position is mainly 60, 70 percent  14 research position. And the 30 or 40 percent  15 remainder is basically -- basically, it's made up of  16 teaching, graduate and undergraduate training and a  17 few hours a month of service.  18 Q And when you refer to service, what do  19 you mean by "service"?  20 A Service means attending committees,  21 departmental meetings, that sort of thing.  22 Q Okay. And in your teaching, what  23 courses do you teach?  24 A Currently, I teach a two-hour course  25 on evidence-based medicine and with a -- with a</p>	<p style="text-align: right;">Page 20</p> <p>1 students working toward a master's or a Ph.D.  2 THE COURT REPORTER: I'm sorry.  3 You -- they have a master's or Ph.D. through  4 the Department of Experimental Medicine? I'm  5 sorry, I missed what you said.  6 THE WITNESS: Yes, so experimental  7 medicine is a department where all faculties of  8 school -- all faculties who are researching in  9 the faculty of medicine can train students  10 through the Department of Experimental  11 Medicine. So it's like an academic hub, if you  12 will, to -- for graduates training in the -- in  13 the faculty of medicine.  14 MR. NIGH: And, Doctor, if Jamie  15 speaks up -- or Ms. Moskowitz, if she speaks  16 up, she just wants to clarify what words you  17 used at the end of a sentence. Patrick is  18 going to be the one asking you questions about  19 like what is that type of thing. Okay?  20 THE WITNESS: Okay.  21 BY MR. GALLAGHER:  22 Q Dr. Etminan, in the -- you referred to  23 graduate and undergraduate students. Do you teach  24 medical students?  25 A Yes, I teach undergraduate medical</p>



<p style="text-align: right;">Page 21</p> <p>1 students. I also have started teaching, as I  2 mentioned to you, undergraduate pharmacy students as  3 well.  4 Q How long have you been a professor at  5 the University of British Columbia?  6 A Since 2008.  7 Q And where were you immediately before  8 you started at the University of British Columbia?  9 A Before -- I held a research associate  10 position at Vancouver General Hospital. Before I  11 was, you know, I started my professorial position, I  12 worked as a research associate for 2 or 3 years at  13 Vancouver Hospital.  14 Q Okay. And, Dr. Etminan, you received  15 a PharmD degree from Idaho State University; is that  16 correct?  17 A That's right.  18 Q Did you do your -- did you attend any  19 other universities for a PharmD program?  20 MR. NIGH: Form objection.  21 THE WITNESS: Yes, I -- I started my  22 PharmD at the University of British Columbia,  23 but I completed it at Idaho State University.  24 BY MR. GALLAGHER:  25 Q And so how many years did you -- what</p>	<p style="text-align: right;">Page 23</p> <p>1 during that postdoctoral fellowship?  2 A I undertook epidemiological studies on  3 prescription drugs, safety questions using launch  4 databases or big data.  5 Q Did any of those studies involve the  6 study of cancer?  7 A No, not -- not during my training at  8 McGill. I wasn't -- no. Or at least I don't  9 remember. I have done a lot of studies. I don't  10 think one of my studies at McGill had anything to do  11 with cancer.  12 Q Okay. Jumping ahead to -- as we  13 discussed just a few minutes ago, you're a professor  14 in the Department of Ophthalmology and Visual  15 Sciences, correct?  16 A That's right.  17 Q And I think you said 60 to 70 percent  18 of your time was -- was research?  19 A That's right.  20 Q What's the primary -- what's the  21 primary focus of your research currently?  22 A My primary focus of my research again  23 is sort of broken down to 40 to 50 percent  24 epidemiology of the eye or ocular diseases or drug  25 safety questions related to the eye. And the rest</p>
<p style="text-align: right;">Page 22</p> <p>1 year did you start the PharmD program at the  2 University of British Columbia?  3 A I believe it was in 1999, or actually  4 1998 or 9, I forget. And I did one year at UBC, and  5 then I transferred and completed my degree at Idaho.  6 Q Okay. Why did you transfer?  7 A I felt that the program, it does not  8 really state my, sort of, objectives, which were  9 more research, pharmaceutical research in  10 epidemiology. It was a more of a clinical program,  11 so I completed it -- Idaho allowed me to finish my  12 degree faster and then go ahead and continue my  13 training in epidemiology.  14 Q Okay. And then after your PharmD, you  15 went to the University of Toronto; is that correct?  16 A That's right.  17 Q And what was the program you were  18 enrolled in at University of Toronto?  19 A It was a master's degree in clinical  20 epidemiology.  21 Q Then looks like subsequently, you did  22 a postdoctoral fellowship at McGill University; is  23 that correct?  24 A That's right.  25 Q What was the nature of your work</p>	<p style="text-align: right;">Page 24</p> <p>1 of the -- the other 40 to 50 percent is drug safety  2 questions on any other area in -- in medicine. So I  3 worked on drugs related to the lung, to the  4 gastrointestinal tract, any -- anything -- any drug  5 safety question that is of public health concern.  6 Q How do you identify drugs that you're  7 going to undertake research on?  8 MR. NIGH: Form objection.  9 THE WITNESS: Well, it's usually case  10 reports or case series or alerts from drug  11 regulatory agencies. Sometimes the media is a  12 good source to highlight important --  13 importance of a safety question. So it could  14 be a combination of all of those, or it could  15 be one of them.  16 BY MR. GALLAGHER:  17 Q You're not a medical doctor, correct?  18 A No.  19 Q And you don't diagnose patients,  20 correct?  21 A No.  22 Q You don't treat patients, correct?  23 A Correct.  24 Q When I asked you about what you did as  25 a professor in the Department of Ophthalmology and</p>

<p style="text-align: right;">Page 25</p> <p>1 Visual Science, you didn't mention anything about  2 clinical involvement. That's not a part of what you  3 do as a professor at the  4 University of British Columbia, correct?  5 A Correct.  6 Q I believe you said you -- I believe  7 you have been deposed four or five times; is that  8 correct?  9 A Correct.  10 Q Have you ever testified at trial?  11 A I testified, I believe, in the lower  12 Manhattan court for Fosamax once, yes.  13 Q Okay. Do you know if your testimony  14 has ever been excluded by a court?  15 MR. NIGH: Form objection.  16 THE WITNESS: I'm not sure. It's  17 possible -- possibly Fosamax, but I'm not  18 100 percent sure.  19 Q Okay.  20 THE COURT REPORTER: I'm sorry. What  21 was that? Fosamax?  22 THE WITNESS: Right. Fosamax.  23 F-o-s-a-m-a-x.  24 THE COURT REPORTER: Oh, Fosamax.  25 Okay. Thank you.</p>	<p style="text-align: right;">Page 27</p> <p>1 I -- that I work at.  2 Q Would you say that you use statistics  3 in your work as an -- as an epidemiologist?  4 A Yes.  5 Q Okay. What does the term  6 "statistically significant" mean --  7 THE COURT REPORTER: I'm sorry.  8 There's -- there's background noise coming in.  9 I'm not sure where it's coming from, but I'm  10 not hearing you well.  11 MR. GALLAGHER: I'll -- I'll repeat  12 the question.  13 BY MR. GALLAGHER:  14 Q What does the term "statistically  15 significant" mean from an epidemiological  16 standpoint?  17 A Actually, it's -- that's a great  18 question. So for many, believe that the  19 statistically significant means that results of a  20 study are -- for example, if the P value is large  21 and the results are not statistically significant,  22 that means that the -- there is really no effect  23 associated with that -- that exposure, carcinogen.  24 But in reality, this is really not the  25 case. And the American Statistical Association, in</p>
<p style="text-align: right;">Page 26</p> <p>1 BY MR. GALLAGHER:  2 Q Dr. Etminan, have you ever withdrawn  3 as an expert in this case?  4 MR. NIGH: Form objection.  5 THE WITNESS: Yes.  6 THE COURT REPORTER: I'm sorry .I need  7 the question repeated.  8 BY MR. GALLAGHER:  9 Q Dr. Etminan, have you ever withdrawn  10 as an expert in a case?  11 MR. NIGH: Form objection.  12 THE WITNESS: Yes.  13 BY MR. GALLAGHER:  14 Q What case did you withdraw as an  15 expert?  16 A It was the Mirena litigation.  17 Q Why did you withdraw?  18 A I felt that I could not contribute  19 anymore to the litigation, and I felt more  20 comfortable to withdraw.  21 Q Dr. Etminan, do you consider yourself  22 to be a statistician?  23 A I'm not a statistician, but I have  24 good familiarity with biostatistics that pertains to  25 my line of work in the area of epidemiology that</p>	<p style="text-align: right;">Page 28</p> <p>1 2016, published commentary to sort of clear the  2 water on this issue.  3 So the correct interpretation of your  4 question on statistical significance means that if  5 some -- if an effect size of a -- from a study is  6 not statistically significant, that means that it  7 does not deviate from the statistical model and  8 assumptions that it -- that it carries with it.  9 It does not have anything -- it does  10 not say anything at all about whether, you know,  11 that particular exposure of a study and the outcome  12 are related or associated. That's -- that's all it  13 means, that the -- the data and the assumptions  14 around that data for that analysis do not deviate.  15 Q So what does that mean, to say that  16 "the data and the assumptions do not deviate"?  17 MR. NIGH: Form objection.  18 THE WITNESS: Again, in more simple  19 terms, when we do a study, there are -- the  20 data that we use. The type of a statistical  21 model that we use carries with it a number of  22 assumptions.  23 And if -- if the results are  24 statistically significant, all it means is that  25 your data, the data that you have from that</p>



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<p>1 study, are, if you will, different than --</p> <p>2 than -- than the model that you're using,</p> <p>3 provided that all other assumptions are met.</p> <p>4 So it's more about whether the data</p> <p>5 fits in the assumptions or not. It's not</p> <p>6 about -- statistically significant means that,</p> <p>7 yes, this exposure causes this outcome, or if</p> <p>8 it's not significant, it means it doesn't.</p> <p>9 That's not what a statistical significant means</p> <p>10 at all.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q So statistical significance -- are you</p> <p>13 saying -- what I understand you to be saying is that</p> <p>14 statistical significance is not evidence of</p> <p>15 causation?</p> <p>16 MR. NIGH: Object to form,</p> <p>17 mischaracterizes his testimony.</p> <p>18 THE WITNESS: Yeah, it's --</p> <p>19 statistical significance doesn't have anything</p> <p>20 to do with causation. Statistical</p> <p>21 significance, again, means how similar is my</p> <p>22 data to the statistical model that I'm using</p> <p>23 provided all other -- all the assumptions that</p> <p>24 need to be met are met. Sometimes they are</p> <p>25 not. But do the assumptions have to -- to be</p>	<p>1 adjusted for multiple variables.</p> <p>2 Q And what's the purpose of doing the</p> <p>3 adjustment?</p> <p>4 A The purpose of an adjustment is to</p> <p>5 make sure that the two groups exposed -- or, say,</p> <p>6 the drug group and the unexposed group are balanced</p> <p>7 with respect to potential confounding variables</p> <p>8 in -- in a particular study.</p> <p>9 However, again, all of these issues</p> <p>10 have intricacies and nuances. And one of the</p> <p>11 nuances is that, you know, adjustment for the wrong</p> <p>12 variable can actually be detrimental as well. So we</p> <p>13 want to make sure that we adjust for variables that</p> <p>14 need to be adjusted for.</p> <p>15 Q How do you determine what variables</p> <p>16 need to be adjusted for?</p> <p>17 A Well, that's an area that actually I</p> <p>18 have been working on for the past few years, and I</p> <p>19 have been advocating. So what one of the -- sort of</p> <p>20 up-and-coming methods is the use of what we call</p> <p>21 "causal diagrams" where we draw -- draw out all the</p> <p>22 common causes of whatever the question is, whether</p> <p>23 it -- exposure on health that you're looking at. We</p> <p>24 draw all the common causes for that question, and</p> <p>25 then we find which -- which are the paths -- what we</p>
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<p>1 met, so, again, there are caveats.</p> <p>2 It also -- statistical significance</p> <p>3 also is a reflection of precision as well.</p> <p>4 Studies with a large sample size are -- are</p> <p>5 more precise in terms of the -- let's say, the</p> <p>6 confidence interval around the effect size</p> <p>7 because there are very large sample sizes.</p> <p>8 Usually, they have higher events.</p> <p>9 Smaller studies with lower sample size</p> <p>10 and lower events usually have a wider</p> <p>11 confidence interval or a larger P value because</p> <p>12 of -- they're -- they're more imprecise. So,</p> <p>13 again, statistical significance and whether an</p> <p>14 exposure is causing an outcome are different --</p> <p>15 are two different entities.</p> <p>16 BY MR. GALLAGHER:</p> <p>17 Q In your work, do you have an</p> <p>18 understanding of the concept of adjusted rate ratio?</p> <p>19 A Yes.</p> <p>20 Q From your perspective, what is an</p> <p>21 adjusted rate ratio?</p> <p>22 A An adjusted rate ratio is a rate</p> <p>23 ratios that's been adjusted using statistical</p> <p>24 modeling for either one other variable, which we</p> <p>25 call covariate. So it could be age, or it could be</p>	<p>1 call "biasing paths" that need to be adjusted for or</p> <p>2 blocked.</p> <p>3 MR. GALLAGHER: Let's mark as the next</p> <p>4 exhibit, Exhibit 3, a paper in which you are an</p> <p>5 author, you cited in your report titled</p> <p>6 "Personal Use of Hair Dyes" --</p> <p>7 THE COURT REPORTER: I'm sorry,</p> <p>8 "Personal Use of Hair Dye" --</p> <p>9 MR. GALLAGHER: "And Risk of Cancer."</p> <p>10 (Whereupon, Exhibit 3 was marked for</p> <p>11 Identification.)</p> <p>12 MR. GALLAGHER: That will be coming up</p> <p>13 shortly.</p> <p>14 BY MR. GALLAGHER:</p> <p>15 Q Do you have it, Dr. Etminan?</p> <p>16 A Is that Exhibit 3?</p> <p>17 Q Yes.</p> <p>18 A Yes, I'm just opening it.</p> <p>19 Q You're familiar with this paper?</p> <p>20 A It's -- it's been a while because it</p> <p>21 was published a few years back, but yes.</p> <p>22 Q Okay. When is the last time you read</p> <p>23 this paper?</p> <p>24 A Many years ago.</p> <p>25 Q Okay. It was published in 2005. That</p>

<p style="text-align: right;">Page 33</p> <p>1 would probably be the last time you read it?</p> <p>2 A Yes.</p> <p>3 Q What was your contribution to this</p> <p>4 paper?</p> <p>5 A Again, as the best of my recollection,</p> <p>6 I helped with the search -- searching of the studies</p> <p>7 and the write of the manuscript -- write-up of the</p> <p>8 manuscript, yeah. So I think mostly gathering the</p> <p>9 evidence and writing the paper up.</p> <p>10 Q Would you consider this to be a</p> <p>11 landmark paper?</p> <p>12 MR. NIGH: Form objection.</p> <p>13 THE WITNESS: It was -- I'm not sure</p> <p>14 what you mean by "landmark," but it was, at</p> <p>15 that time, the first study or review,</p> <p>16 comprehensive review of the topic.</p> <p>17 BY MR. GALLAGHER:</p> <p>18 Q If we go to Page 2519, which I think</p> <p>19 is the fourth page of the document, do you see</p> <p>20 there's a section here called "Quality Assessment"?</p> <p>21 A Yes.</p> <p>22 Q What was the purpose of doing a</p> <p>23 quality assessment?</p> <p>24 THE COURT REPORTER: I'm sorry.</p> <p>25 Doctor, can you start that again, please?</p>	<p style="text-align: right;">Page 35</p> <p>1 under -- do you see there's a heading "Comment," the</p> <p>2 paragraph right under that.</p> <p>3 So it looks like the -- in this --</p> <p>4 this paper your -- the results indicated that</p> <p>5 there's no effect of personal hair dye use on the</p> <p>6 risk of breast and bladder cancer; is that correct?</p> <p>7 A Yes.</p> <p>8 Q And you concluded, there's a</p> <p>9 borderline effect for hematopoietic cancers, but the</p> <p>10 evidence of a causal effect is too weak to represent</p> <p>11 a major public health concern.</p> <p>12 How did you --</p> <p>13 MR. NIGH: We couldn't hear you. It</p> <p>14 just broke up during your question, Patrick.</p> <p>15 THE WITNESS: Sorry. Patrick, can you</p> <p>16 repeat your question? I'm okay.</p> <p>17 MR. GALLAGHER: Yes, I will repeat the</p> <p>18 question.</p> <p>19 BY MR. GALLAGHER:</p> <p>20 Q How did you decide that the causal</p> <p>21 effect is too weak?</p> <p>22 MR. NIGH: Form objection.</p> <p>23 THE WITNESS: Honestly, I -- I don't</p> <p>24 remember. It's -- it's way back. Could have</p> <p>25 been just the numbers that we got. I don't</p>
<p style="text-align: right;">Page 34</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q What was the purpose of doing a</p> <p>3 quality assessment?</p> <p>4 A The purpose of a quality assessment</p> <p>5 was to look at the quality of the studies that was</p> <p>6 included.</p> <p>7 Q And it looks like you tried to</p> <p>8 establish an objective 10-point scale to evaluate</p> <p>9 the quality of the study; is that correct?</p> <p>10 A Let me just read it for a second.</p> <p>11 Q Sure.</p> <p>12 A So it seems like from the description</p> <p>13 that we came up with our own sort of a description</p> <p>14 of a quality assessment. It's nothing that is -- is</p> <p>15 validated. We kind of improvised based on this --</p> <p>16 you know, the type of data that we had.</p> <p>17 Q Okay. But you established specific</p> <p>18 criteria by which the quality of the -- each of the</p> <p>19 studies that were included was evaluated?</p> <p>20 A Yes.</p> <p>21 Q Is that correct?</p> <p>22 MR. NIGH: Object to the form.</p> <p>23 THE WITNESS: Yeah.</p> <p>24 BY MR. GALLAGHER:</p> <p>25 Q If we go to Page 2523 of the article,</p>	<p style="text-align: right;">Page 36</p> <p>1 remember exactly how we decided on the wording</p> <p>2 of -- of the comment.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q If we go back one page to Page 2522,</p> <p>5 look at Table 6, which looks like is presenting</p> <p>6 pooled relative risks of hematopoietic cancers of</p> <p>7 hair dye use.</p> <p>8 THE COURT REPORTER: I'm sorry. Can</p> <p>9 you repeat that?</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q Table 6 is presenting the pooled</p> <p>12 relative risks of hematopoietic cancers in hair dye</p> <p>13 use, correct?</p> <p>14 A Yes.</p> <p>15 Q Are these the numbers that -- that</p> <p>16 you're referring to that you would have looked at to</p> <p>17 decide the -- the causal effect is too weak?</p> <p>18 MR. NIGH: Form objection. That</p> <p>19 misstates the -- the evidence of the prior</p> <p>20 document.</p> <p>21 THE WITNESS: Yes. We probably looked</p> <p>22 at these numbers to come up with a conclusion.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q What does it mean for -- for the</p> <p>25 relative risk to be --</p>

<p style="text-align: right;">Page 37</p> <p>1 THE COURT REPORTER: To be what?</p> <p>2 MR. GALLAGHER: One.</p> <p>3 THE WITNESS: One means there's no</p> <p>4 effect. There is no causal link.</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q Is the relative risk looking at a</p> <p>7 causal link or looking at an association?</p> <p>8 A Well, again, for the purposes of this</p> <p>9 paper -- this academic paper, you can use</p> <p>10 association, if you will. And so a relative risk of</p> <p>11 1.0 would be no association.</p> <p>12 Q Okay. And then I guess more broadly,</p> <p>13 the concept of the relative risk generally is</p> <p>14 looking at an association. It's not determinative</p> <p>15 of causation, correct?</p> <p>16 MR. NIGH: Form objection.</p> <p>17 THE WITNESS: No, I disagree with</p> <p>18 that. A relative risk is just a measure of</p> <p>19 effect. I mean, if you have -- you could have</p> <p>20 a relative risk from a very well-designed</p> <p>21 randomized trial, which is a, you know, true</p> <p>22 experiment. That relative risk would probably</p> <p>23 mean, to a high degree of certainty, a</p> <p>24 causation.</p> <p>25 So it's not the relative risk --</p>	<p style="text-align: right;">Page 39</p> <p>1 THE COURT REPORTER: Whether the</p> <p>2 substance causes what?</p> <p>3 THE WITNESS: Whatever outcome that we</p> <p>4 are looking at.</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q If in this article, we go ahead to</p> <p>7 Page 2524. In the middle column, the last full</p> <p>8 paragraph starts "The borderline effect." In this</p> <p>9 section of your paper, you wrote, "The borderline</p> <p>10 effect observed for brain tumors and ovarian cancer</p> <p>11 is based on the pooling of only two studies and does</p> <p>12 not permit a meaningful assessment of the risk."</p> <p>13 Do you see that?</p> <p>14 A Yes.</p> <p>15 Q So you agree that, here, only looking</p> <p>16 at two studies wasn't -- wasn't sufficient to be</p> <p>17 able to evaluate the risk of hair dye for</p> <p>18 development of brain tumors and ovarian cancer,</p> <p>19 correct?</p> <p>20 MR. NIGH: Form objection.</p> <p>21 THE WITNESS: I mean, that's what we</p> <p>22 have. And again, you have to factor in a</p> <p>23 number of, I think, points. One is that my</p> <p>24 knowledge in causal inference in 2005 was not</p> <p>25 the same as it is now, so I may have done</p>
<p style="text-align: right;">Page 38</p> <p>1 whether it's a relative risk or the odds ratio</p> <p>2 that's presenting the effect size. It's the</p> <p>3 study design, and all the other factors that</p> <p>4 have gone into the study design, and the</p> <p>5 methodology that would tell you whether you</p> <p>6 believe the numbers are a causal blame versus</p> <p>7 an association.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q And so what -- what factors -- how do</p> <p>10 you determine whether a study is -- is being used</p> <p>11 to -- to evaluate an association versus being used</p> <p>12 to evaluate causation?</p> <p>13 MR. NIGH: Form objection.</p> <p>14 THE WITNESS: So if I'm looking at one</p> <p>15 study, I look at the methodology, the -- the</p> <p>16 way -- you know, the type of biases that may</p> <p>17 have played and whether those biases actually</p> <p>18 would reverse the direction of the effect side,</p> <p>19 would change the results or not. If I'm</p> <p>20 looking at a more broader question, then I am</p> <p>21 looking at the totality of the evidence.</p> <p>22 So again, one study from a journal, I</p> <p>23 kind of look at it differently than, you know,</p> <p>24 a real-life broader question, where I have to</p> <p>25 decide whether the substance causes --</p>	<p style="text-align: right;">Page 40</p> <p>1 things differently.</p> <p>2 And a lot of what we write in these</p> <p>3 academic papers is also influenced by the</p> <p>4 editors who tell us, sort of, what type of</p> <p>5 wording to use, sometimes.</p> <p>6 So, you know, yes, that's what we say</p> <p>7 here on this specific paper, and that's what</p> <p>8 was said. But I think there are sort of</p> <p>9 caveats to that.</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q Do you disagree with this statement in</p> <p>12 your paper?</p> <p>13 A I don't disagree that that's what we</p> <p>14 said. But, again, the specific wording of that</p> <p>15 statement -- going back, I'm not sure what</p> <p>16 discussions we had -- could have been also</p> <p>17 influenced by the editors wanting us to sort of</p> <p>18 lower the tone, perhaps. Or in this case, you know,</p> <p>19 it is -- it could have been possible -- I'm not</p> <p>20 familiar with this area right now, with this area of</p> <p>21 hair dye and cancers.</p> <p>22 But back then, it would have been</p> <p>23 feasible to say that with two studies, it's not a</p> <p>24 meaningful risk based on the data that we had then.</p> <p>25 Q So you made -- do you believe that the</p>

<p style="text-align: right;">Page 41</p> <p>1 editors asked you to change the wording of this  2 specific sentence in this paper?  3 A I -- I don't know.  4 MR. NIGH: Form objection.  5 THE WITNESS: I'm not saying that they  6 did. I'm just saying sometimes in academic  7 writing, if I want to say -- if I believe from  8 my study that this drug causes this disease, at  9 times we are -- we do receive pushback for,  10 sort of, a lighter tone in that -- in  11 presenting that statement.  12 And I don't know if this happened here  13 or not, but I'm just saying that it's -- it  14 could have been possible that this sentence  15 came up with my contribution, my other authors'  16 contribution and potentially the contribution  17 of other editors as well.  18 BY MR. GALLAGHER:  19 Q In your academic work, when you're  20 submitting articles for publication, do you allow  21 editors to change the language of the article that  22 you have written?  23 MR. NIGH: Form objection.  24 BY MR. GALLAGHER:  25 Q To something that you don't agree</p>	<p style="text-align: right;">Page 43</p> <p>1 BY MR. GALLAGHER:  2 Q Dr. Etminan, does this refresh your  3 recollection as to when you first spoke with  4 plaintiffs' counsel about this case?  5 A Yes, probably around those dates,  6 around those dates or maybe a bit before.  7 Q Okay. Around the time that you first  8 became involved in this case, did plaintiffs'  9 attorneys send you any documents?  10 A They -- yeah. I mean, they may have  11 sent me some articles on the topic, and then as we  12 went along, there were more documents that I  13 reviewed.  14 Q Okay. Are -- are some of the articles  15 that they provided to you articles that you cited in  16 your report?  17 A I mean, I did -- I did my own  18 systematic search. Some of the articles at the end  19 would have -- could have been, you know, also the  20 ones that they may have provided as well. But I  21 didn't go with what they gave me. I went with my --  22 the articles that came out of my systematic review.  23 Q Okay. Have you ever seen any of these  24 articles prior to being involved in this litigation?  25 A I can't recall. I mean, I read a lot</p>
<p style="text-align: right;">Page 42</p> <p>1 with?  2 MR. NIGH: Form objection.  3 THE WITNESS: Well, it's a collective  4 agreement. They make suggestions, and we look  5 at the suggestions. And we agree or disagree.  6 So it's -- you know, it's in -- you know,  7 different situations are different.  8 MR. GALLAGHER: Okay. We can take  9 this -- take this exhibit down.  10 Let's mark as Exhibit 4 your invoices.  11 THE WITNESS: Okay.  12 MR. GALLAGHER: Which, I believe, they  13 provided -- were provided through the  14 plaintiffs' counsel in response to the document  15 requests.  16 (Whereupon, Exhibit 4 was marked for  17 Identification.)  18 MR. GALLAGHER: That will be uploaded  19 shortly.  20 BY MR. GALLAGHER:  21 Q Dr. Etminan --  22 MR. GALLAGHER: If we can go to the  23 last page of this collection of invoices. I  24 believe they are in reverse chronological  25 order.</p>	<p style="text-align: right;">Page 44</p> <p>1 on different topics.  2 MR. GALLAGHER: Let's mark as  3 Exhibit 5 a copy of your report.  4 (Whereupon, Exhibit 5 was marked for  5 Identification.)  6 BY MR. GALLAGHER:  7 Q Is it up? Do you have it there?  8 A Yeah, I have it.  9 Q Okay.  10 A Yes.  11 Q If you go up to page -- let's start at  12 Page 12 of your report.  13 A Okay.  14 Q At the bottom, Section 8.1, you talk  15 about a search strategy and study ascertainment. Do  16 you see that section?  17 A Yes.  18 Q Is this the search strategy that you  19 were just referring to for your identification of --  20 of articles?  21 A Sorry. I lost you there. What was  22 the question?  23 Q Sure. A few minutes ago, you had  24 referenced, I think you called it a systematic  25 search that you had done?</p>

<p style="text-align: right;">Page 45</p> <p>1 A Yes.</p> <p>2 Q Is this the search strategy that you</p> <p>3 are referring to?</p> <p>4 A Yes.</p> <p>5 Q How did you come up with this</p> <p>6 particular search strategy?</p> <p>7 A Well, I mean, I have done a lot of</p> <p>8 search strategies for my work, so I -- the question</p> <p>9 is on the risk of cancer and --</p> <p>10 THE COURT REPORTER: I'm sorry -- and</p> <p>11 what?</p> <p>12 THE WITNESS: NDMA.</p> <p>13 So I identified the MeSH terms, the</p> <p>14 medical subject heading terms that would</p> <p>15 capture NDMA and combined it with cancer,</p> <p>16 including different types of cancer, and</p> <p>17 restricted it to epidemiological studies</p> <p>18 because those are the type of studies that I</p> <p>19 wanted to look at. So in a nutshell, that was</p> <p>20 the structure of the search.</p> <p>21 BY MR. GALLAGHER:</p> <p>22 Q Okay. And then if we go to the next</p> <p>23 page, Page 13, it's referring to study inclusion and</p> <p>24 exclusion criteria. Do you see that?</p> <p>25 A Yes.</p>	<p style="text-align: right;">Page 47</p> <p>1 is -- is looking at a causal association of dietary</p> <p>2 intake of red meat and cancer is going to include</p> <p>3 exposure to other carcinogens, correct?</p> <p>4 MR. NIGH: Form objection.</p> <p>5 THE WITNESS: Yes. There are -- there</p> <p>6 are carcinogens in red meat. But my interest</p> <p>7 is looking at the risk of cancer with the NDMA</p> <p>8 component. And if the study did not measure</p> <p>9 NDMA, sort of, separately, then it is very</p> <p>10 difficult to draw a causal relation between the</p> <p>11 NDMA and cancer in the meat product or other</p> <p>12 carcinogens and cancer in the meat product.</p> <p>13 BY MR. GALLAGHER:</p> <p>14 Q Okay. If you look under "Study</p> <p>15 Exclusion Criteria," the sentence immediately after</p> <p>16 the bolded underlined sentence. It says, "Moreover,</p> <p>17 lack of quantifying or categorizing (low versus</p> <p>18 high) NDMA/NDEA amounts in these studies will make</p> <p>19 it difficult to necessarily draw a causal link."</p> <p>20 Do you see that?</p> <p>21 A Uh-huh.</p> <p>22 Q So were you only looking for studies</p> <p>23 that would support the conclusion of a causal link?</p> <p>24 MR. NIGH: Form objection.</p> <p>25 THE WITNESS: No, I'm not sure -- I'm</p>
<p style="text-align: right;">Page 46</p> <p>1 Q How did you come up with the inclusion</p> <p>2 and exclusion criteria?</p> <p>3 A In order to, again, assess a causation</p> <p>4 for this question, I needed the studies to have</p> <p>5 presented some sort of an effect size, like the</p> <p>6 relative risk or an odds ratio or hazard ratio, have</p> <p>7 identified the outcome, cancer, and also have -- it</p> <p>8 has to have measured NDMA because I don't want to</p> <p>9 mix -- did not want to mix studies that included</p> <p>10 other carcinogens with NDMA. So that had to be one</p> <p>11 of the key criteria.</p> <p>12 And I think those are the main</p> <p>13 criteria that I included.</p> <p>14 Q Okay. What do you mean when you say</p> <p>15 you didn't want to use studies that mixed other</p> <p>16 carcinogens with NDMA?</p> <p>17 A Well, you have a lot of studies on</p> <p>18 diet and processed food that also have looked at</p> <p>19 cancer that we know that -- for example, you know,</p> <p>20 red meat that could have NDMA, but it could also</p> <p>21 have other carcinogens that also contribute to</p> <p>22 cancer. So I wanted -- I wanted this study to</p> <p>23 specifically look at NDMA and cancer.</p> <p>24 Q Okay. But the -- but the study -- so</p> <p>25 if the study is looking at red meat, any study that</p>	<p style="text-align: right;">Page 48</p> <p>1 not clear on your question. So the sentence</p> <p>2 says, "Studies of meat intake where NDMA was</p> <p>3 not measured."</p> <p>4 Again, if -- if the study is looking</p> <p>5 at meat and that -- that meat product has NDMA</p> <p>6 and other carcinogens and they show a risk with</p> <p>7 cancer, we can never tell what caused the</p> <p>8 cancer. Was it the NDMA component or the other</p> <p>9 components? So those studies that did not</p> <p>10 specify NDMA measurement were excluded.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q Okay. Did you -- did you review or</p> <p>13 consider studies that were not cited in your report?</p> <p>14 A You mean to reach my conclusion in the</p> <p>15 report?</p> <p>16 Q We'll start with it more broadly.</p> <p>17 Did you review and consider studies</p> <p>18 that were not cited in your report?</p> <p>19 A I -- I reviewed studies that met my</p> <p>20 inclusion criteria that were included in my report.</p> <p>21 Q So -- but were there -- were there</p> <p>22 studies that met your inclusion criteria that you</p> <p>23 reviewed that you haven't cited in your report?</p> <p>24 A I don't believe so. If it's not in</p> <p>25 the report, it's because it didn't have the</p>



<p style="text-align: right;">Page 49</p> <p>1 inclusion criteria. For example, it, you know, did 2 not provide odds ratios or relative risks or NDMA 3 levels. That -- I mean, that's -- that's why they 4 were not in the report. 5 Q Okay. Some of the -- of the papers 6 that you cited in your report are occupational 7 studies, correct? 8 A Correct. 9 Q What is "occupational studies"? 10 A Occupational epidemiological studies 11 are studies that -- that look at risk of, whether 12 it's cancer, or it could be cardiovascular disease, 13 in people who are exposed to an occupational 14 exposure, so -- you know, people working in 15 factories or rubber factories or, you know, hair dye 16 factories. I mean, those would be considered 17 examples of occupational exposure. 18 Q And the occupational studies that you 19 looked at for your report were looking at people 20 working in rubber factories, correct? 21 A Yes, the Hidajat studies and a couple 22 of other ones that -- 23 THE COURT REPORTER: I'm sorry. The 24 what studies? 25 THE WITNESS: Hidajat, spelled</p>	<p style="text-align: right;">Page 51</p> <p>1 THE WITNESS: I don't remember the 2 specific numbers, but I think it's important to 3 know, and I agree with you, that they would be 4 exposed to a -- a number of different 5 carcinogens. 6 BY MR. GALLAGHER: 7 Q Okay. In these -- in these 8 occupational studies -- strike that. Let's go ahead 9 and mark them, first. 10 MR. GALLAGHER: So let's mark as 11 Exhibit 6 the McElvenny article 7 is the Straif 12 article. 13 THE COURT REPORTER: Is the what 14 article? 15 MR. GALLAGHER: Straif, S-t-r-a-i-f 16 article. 17 A n d Exhibit 8 will be the Hidajat 18 article. 19 (Whereupon, Exhibit 6 was marked for 20 Identification.) 21 (Whereupon, Exhibit 7 was marked for 22 Identification.) 23 (Whereupon, Exhibit 8 was marked for 24 Identification.) 25 THE COURT REPORTER: Can I take one</p>
<p style="text-align: right;">Page 50</p> <p>1 H-i-d-a-j-a-t. 2 BY MR. GALLAGHER: 3 Q And are -- how -- for -- for people 4 working in the rubber industry, how many different 5 carcinogens are they exposed to by virtue of working 6 in a rubber factory? 7 MR. NIGH: Form objection. 8 THE WITNESS: They could be different 9 carcinogen exposures. 10 BY MR. GALLAGHER: 11 Q Do you have an estimate for how many 12 different carcinogens they're exposed to? 13 MR. NIGH: Form objection. 14 THE WITNESS: No, I don't. 15 BY MR. GALLAGHER: 16 Q So you don't know -- you reviewed -- 17 you reviewed a few of these occupations studies, but 18 you don't know how many different carcinogens the 19 rubber workers are exposed to by virtue of working 20 in a rubber factory? 21 MR. NIGH: Form objection. 22 THE WITNESS: I don't remember -- 23 MR. NIGH: Hold on. Hold on. Let me 24 object to the form first. Form objection. 25 Go ahead, Doctor.</p>	<p style="text-align: right;">Page 52</p> <p>1 minute? I don't need to go off the record. 2 Can I take one minute? 3 MR. GALLAGHER: Why don't we go ahead 4 and go off the record for a minute? 5 THE VIDEOGRAPHER: The time is now 6 9:09. This ends Media Unit Number 1. We're 7 going off the record. 8 (Whereupon, a short break was taken.) 9 THE VIDEOGRAPHER: The time is now 10 9:11. This begins Media Unit Number 2. We're 11 back on the record. 12 BY MR. GALLAGHER: 13 Q Okay. Dr. Etminan, we have marked as 14 Exhibits 6, 7 and 8 three articles you cited in your 15 report that are all occupational studies. 16 A Yes. 17 Q McElvenny paper, the Straif paper and 18 the Hidajat paper. Do you see those? 19 A Yeah. 20 MR. NIGH: We don't -- I don't see 21 Number 8 in the Dropbox, in the chat, I mean. 22 There we go. Just came up. 23 MR. GALLAGHER: Sorry. It was a bit 24 late. 25</p>



<p style="text-align: right;">Page 53</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q And each of these three papers is</p> <p>3 looking at -- are occupational studies looking at</p> <p>4 risk of cancer in workers at rubber factories,</p> <p>5 correct?</p> <p>6 A Generally speaking, they are, but they</p> <p>7 are a little different in terms of the study design.</p> <p>8 Q When you say they're a little</p> <p>9 different, do you mean each of the studies is</p> <p>10 slightly different from the other study in their</p> <p>11 study design?</p> <p>12 A Well, I mean, the main difference</p> <p>13 between McElvenny and Hidajat is that McElvenny just</p> <p>14 looked at cancer with occupational exposure, whereas</p> <p>15 Hidajat actually teased out the NDMA exposure</p> <p>16 component, looked at different -- those categories</p> <p>17 for each cancer, and took a number of methodological</p> <p>18 steps to reduce potential biases that McElvenny did</p> <p>19 not do.</p> <p>20 Q Okay. You included McElvenny in --</p> <p>21 why did you include McElvenny in your report?</p> <p>22 MR. NIGH: Form objection.</p> <p>23 THE WITNESS: I -- I wanted to also</p> <p>24 just briefly touch on other occupational</p> <p>25 studies as well, because if I hadn't, then</p>	<p style="text-align: right;">Page 55</p> <p>1 Bradford Hill criteria and the main, sort of,</p> <p>2 framework of my opinion on the causal effects.</p> <p>3 I mention -- I briefly mentioned McElvenny and</p> <p>4 Straif because they are also other -- the other</p> <p>5 relatively well-cited occupational exposure</p> <p>6 cancer studies, and I mentioned them as, you</p> <p>7 know, background in my -- in the paragraph.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q But I am correct that McElvenny meets</p> <p>10 the exclusion criteria that you set out for studies</p> <p>11 that should be excluded?</p> <p>12 A Yes.</p> <p>13 Q Okay. For these occupational studies,</p> <p>14 the method of exposure was primarily through</p> <p>15 inhalation or skin contact. Would you agree with</p> <p>16 that?</p> <p>17 MR. NIGH: Form objection.</p> <p>18 THE WITNESS: Yeah.</p> <p>19 BY MR. GALLAGHER:</p> <p>20 Q Okay. And that method of exposure is</p> <p>21 different from the method of exposure that's at</p> <p>22 issue in this case, correct?</p> <p>23 A The method of exposure is different,</p> <p>24 but my -- the question, the general causation</p> <p>25 question that I -- that my report refers to does not</p>
<p style="text-align: right;">Page 54</p> <p>1 there would be a question of, you know, why did</p> <p>2 you -- why did you only look at Hidajat. So I</p> <p>3 wanted to mention that there are these</p> <p>4 occupational studies as well, but my focus was</p> <p>5 on the study by Hidajat because it met the main</p> <p>6 inclusion criteria for my question.</p> <p>7 Q Did the McElvenny study -- article,</p> <p>8 though, meet your exclusion criteria?</p> <p>9 A It may have because they did not</p> <p>10 include NDMA. And again, I just mentioned that it's</p> <p>11 not in my main analytical framework of evidence when</p> <p>12 I'm deciding on the causal question. But I just</p> <p>13 thought to introduce, you know, just to mention it</p> <p>14 as background that there -- you know -- and it is</p> <p>15 part of Hidajat -- in a way related to Hidajat.</p> <p>16 It's an older version of Hidajat, so I thought I</p> <p>17 should mention it.</p> <p>18 Q So you included the McElvenny article</p> <p>19 in your report even though it met the exclusion</p> <p>20 criteria for studies that should be excluded?</p> <p>21 A Again --</p> <p>22 MR. NIGH: Form objection.</p> <p>23 THE WITNESS: The -- the -- the</p> <p>24 inclusion criteria is -- is mainly used to form</p> <p>25 my opinion, which, again, is included in the</p>	<p style="text-align: right;">Page 56</p> <p>1 specify cause of cancer with NDMA with respect to</p> <p>2 different rounds of exposure. It refers to,</p> <p>3 generally speaking, exposure. And we mean systemic</p> <p>4 exposure, which could be mouth or through the skin</p> <p>5 or through inhalation cause cancer.</p> <p>6 Q Okay. So the question that you were</p> <p>7 evaluating was not whether NDMA ingested orally</p> <p>8 could cause certain cancers; is that correct?</p> <p>9 MR. NIGH: Form objection.</p> <p>10 THE WITNESS: No, that's not -- that's</p> <p>11 not what I said. The question that I addressed</p> <p>12 was: Does exposure to NDMA and exposure would</p> <p>13 mean NDMA that gets in to the body systemic --</p> <p>14 systemically absorbed NDMA, which can be</p> <p>15 through oral, inhalation, skin. I think mainly</p> <p>16 those are the -- the main routes of the</p> <p>17 exposure. Does builds -- does exposure to NDMA</p> <p>18 through any of those routes that make it</p> <p>19 systemic in the body cause cancer.</p> <p>20 BY MR. GALLAGHER:</p> <p>21 Q So is -- the question that you were</p> <p>22 addressing was more broadly, does exposure to NDMA</p> <p>23 in any manner have an association or potentially</p> <p>24 lead to cancer; is that correct?</p> <p>25 A Any matter that -- that leads to</p>

<p style="text-align: right;">Page 57</p> <p>1 systemic absorption. So if I could clarify, so  2 if -- if -- if for -- let's say, hypothetically,  3 there was a study where a person inhaled NDMA for  4 one day, that -- that would not really be systemic  5 absorption of NDMA. But if in a study of a 40-year  6 follow up, people are exposed to NDMA through skin  7 and inhalation, you can be sure that they are,  8 throughout the time of follow up, are getting  9 exposed to NDMA systemically.  10 Q Okay. Let me unpack that a little  11 bit.  12 So you're referring to a time frame  13 component?  14 A Yes, I mean the studies that I  15 included are epidemiological studies. They are --  16 either follow a patient forward or have asked about  17 their intake. So they -- they have been followed  18 for a time, and these patients have been exposed to  19 NDMA over time.  20 Q Okay. Do you agree with me that  21 the -- that the method of -- what the method of  22 exposure is to NDMA can have an impact on what  23 tissues in body are exposed to NDMA?  24 A Can you clarify the question, please?  25 Q Sure. I guess do you have any</p>	<p style="text-align: right;">Page 59</p> <p>1 little bit about the type of study you're  2 asking about?  3 BY MR. GALLAGHER:  4 Q Sure. I don't think I'm asking about  5 a study, necessarily. I'm asking if you have an  6 understanding of whether the -- do you have any  7 understanding whether an exposure to NDMA through  8 oral ingestion versus exposure through inhalation  9 has any differences in the tissues that are  10 ultimately exposed -- ultimately exposed to NDMA?  11 A No. I mean, I think that's -- that's  12 sort of like a toxicology type of question. I don't  13 know of any details of specific concentration of  14 NDMA in each organ, no.  15 Q Okay. Let's look at the Straif  16 article that's Exhibit 7.  17 So in your report, you say -- you say  18 that there with an increase in the risk of --  19 THE COURT REPORTER: In the risk of --  20 I'm sorry. In the risk of what?  21 MR. GALLAGHER: All cancer deaths.  22 THE COURT REPORTER: I'm not  23 understanding.  24 MR. GALLAGHER: I'll repeat the  25 question.</p>
<p style="text-align: right;">Page 58</p> <p>1 understanding -- let me ask it this way: Do you  2 have any understanding whether different tissues are  3 exposed to NDMA if the exposure is through  4 inhalation versus through skin contact versus oral  5 ingestion?  6 A From animal studies, we know that it  7 has caused cancer from those different routes of  8 administration in animals. In humans, again,  9 exposure to NDMA where it gets into your system can  10 affect different organs, just like smoking --  11 primarily smoking causes lung cancer. But we have  12 evidence that it can also cause other cancers.  13 So it's not that -- although it's  14 mostly affecting the lung, that the carcinogen is  15 probably affecting other -- other organs as well.  16 Q Okay. I understand what you're  17 saying, but do you have any understanding whether  18 the method by which a person is exposed to NDMA  19 impacts the tissues that are actually exposed to  20 NDMA?  21 MR. NIGH: Form objection.  22 THE WITNESS: You mean like a  23 toxicology study or an epidemiological study  24 that looks at different tissue levels with  25 respect to cancer? Can you, maybe, elaborate a</p>	<p style="text-align: right;">Page 60</p> <p>1 BY MR. GALLAGHER:  2 Q In your report, you say about the  3 Straif study that there was an increase in the risk  4 of all cancer deaths. And you identify the relative  5 risk of 1.4 with the confidence interval of 1 to  6 1.8?  7 A Let me find that, just one second.  8 Q Okay. If you look at Page 14 of your  9 report.  10 A Okay. 14, okay. Okay.  11 Q So you agree that this -- this was not  12 statistically significant?  13 MR. NIGH: Form objection.  14 THE WITNESS: I think it just missed  15 the statistical significance because it -- the  16 lower balance starts with 1.0.  17 BY MR. GALLAGHER:  18 Q So it did miss the statistical  19 significance because the lower bound of the  20 95 percent --  21 THE COURT REPORTER: Can you repeat  22 that, please?  23 MR. GALLAGHER: Sure.  24 BY MR. GALLAGHER:  25 Q Sure. It missed statistical</p>

<p style="text-align: right;">Page 61</p> <p>1 significance because the lower bound of 95 percent  2 confidence interval included 1.0, correct?  3 A Correct.  4 Q And as we discussed previously, a  5 relative risk of 1.0 means there's no association  6 between the exposure and the risk that's being  7 validated, correct?  8 A Well, the relative risk is 1.4. The  9 lower bound is 1.0. And, again, it speaks to  10 precision. I cannot -- I cannot exclude this  11 size -- this relative risk of 1.4 and just say it's  12 not -- because it's not statistically significant,  13 there is no harm. Again, I -- I think we spoke  14 about the caveats of interpretation of what the  15 P value is and statistical significance really  16 means.  17 So I mean, it is a 1.4 relative risk  18 with those confidence intervals.  19 Q Okay. If you were to present data to  20 a peer --  21 THE COURT REPORTER: To appear what?  22 BY MR. GALLAGHER:  23 Q To a peer-reviewed journal, like this  24 where the confidence interval includes 1.0.  25 A Uh-huh.</p>	<p style="text-align: right;">Page 63</p> <p>1 A There's usually a peer review of two  2 or more peers, external reviewers, and then there  3 is -- yes, there is an editor that also reviews it.  4 Q And when -- what is the purpose of the  5 peer-review process?  6 A The peer-review process is to try to  7 ensure as much as possible, and sometimes that does  8 not happen, but the process is there to ensure that  9 the research is -- is vetted and -- and checked  10 before it's published.  11 Q Okay. And when you -- when you submit  12 an article for the peer-review process, is it  13 sometimes either the peer reviewers or the editors  14 ask you to make changes to the article?  15 A Yes, usually they do.  16 Q And part of the purpose of that peer  17 review process and the changes that they may ask for  18 is to improve the scientific accuracy and validity  19 of what's being published, right?  20 A That is correct.  21 MR. NIGH: Objection.  22 BY MR. GALLAGHER:  23 Q Okay. And the report, Exhibit 5, that  24 you submitted in this litigation, your expert  25 report, that was not submitted through peer review,</p>
<p style="text-align: right;">Page 62</p> <p>1 Q Would you expect that peer-reviewed  2 journal would not let you say that there was  3 statistically significant association?  4 MR. NIGH: Form objection.  5 THE WITNESS: Again, it -- it depends  6 on the journal on the editorial board. The  7 statistical significant, sort of, misnomer, if  8 you will, that I talked about, is relatively  9 recent. And the American Statistical  10 Association put out this correction on the  11 interpretation of this -- this topic in 2016.  12 So it will take a while before most editorial  13 boards and editors really come to grasp of  14 what -- what this concept means.  15 So, again, because up until now, a lot  16 of these editors are sort of interested in  17 statistical significance versus nonstatistical  18 significance. It's possible that some journals  19 still ask that.  20 BY MR. GALLAGHER:  21 Q I believe we've talked about this a  22 couple of times now. When you submit an article for  23 consideration to be published in a peer-reviewed  24 journal, there's review by, you call them editors;  25 is that right?</p>	<p style="text-align: right;">Page 64</p> <p>1 correct?  2 A No.  3 Q Looking at the Straif article, Exhibit  4 7, specifically on Page 181.  5 A Yes.  6 Q I'll come back to that later.  7 MR. GALLAGHER: Let's take maybe a  8 10-minute break right now.  9 THE WITNESS: Sure.  10 THE VIDEOGRAPHER: The time is  11 9:33 a.m. and we're going off the record.  12 (Whereupon, a short break was taken.)  13 THE VIDEOGRAPHER: The time is now  14 9:47. We're back on the record.  15 BY MR. GALLAGHER:  16 Q Welcome back, Dr. Etminan.  17 A Thank you.  18 Q If you look at Page 14 of your report,  19 the paragraph about -- where you're writing about  20 the McElvenny article?  21 A Uh-huh.  22 Q Is that -- this is Exhibit 5, the --  23 towards the bottom of that paragraph, you say,  24 "These men might have been exposed to carcinogens  25 other than NDMA and NDEA"?</p>

<p style="text-align: right;">Page 65</p> <p>1 A Yes.</p> <p>2 Q And, in fact, working in the rubber</p> <p>3 factories, they probably were exposed to many</p> <p>4 carcinogens other than NDMA and NDEA, right?</p> <p>5 A Yes, possible.</p> <p>6 Q And the same would be true for the</p> <p>7 rubber workers who are study subjects of the Straif</p> <p>8 article?</p> <p>9 A Yeah.</p> <p>10 Q And the same would be true for the</p> <p>11 cohort of rubber workers that were subjects of the</p> <p>12 Hidajat article, right? Those men would have been</p> <p>13 exposed to many carcinogens other than NDMA and</p> <p>14 NDEA, correct?</p> <p>15 A If I could clarify, so, yes, all of</p> <p>16 these men were working in these factories, and they</p> <p>17 were exposed to a number of carcinogens, including</p> <p>18 NDMA. However, Hidajat was the only one that</p> <p>19 actually quantified NDMA in different levels. And</p> <p>20 if -- if you're inferring that there could be a</p> <p>21 potential risk of cancer with other carcinogens,</p> <p>22 that is true. However, we have to actually know</p> <p>23 that the -- the men who are on the highest NDMA</p> <p>24 exposure in the Hidajat study are actually exposed</p> <p>25 more to other carcinogens than the men in the lower</p>	<p style="text-align: right;">Page 67</p> <p>1 "Exposures vary throughout the rubber manufacturing</p> <p>2 process."</p> <p>3 Do you see that?</p> <p>4 A Yes.</p> <p>5 Q So that's following a list of several</p> <p>6 potential -- exposures to potential carcinogens that</p> <p>7 exist in the -- in the rubber factory, and it's</p> <p>8 saying that the exposures vary throughout the rubber</p> <p>9 manufacturing process, right?</p> <p>10 A What was your -- the last part of your</p> <p>11 comment? Sorry. I couldn't hear.</p> <p>12 Q It's saying here that the exposures to</p> <p>13 these potential carcinogens vary throughout the</p> <p>14 rubber manufacturing process, right?</p> <p>15 A Yes, they vary, yeah.</p> <p>16 Q And then going to the next page,</p> <p>17 Page 251, the right-hand column, the top heading,</p> <p>18 "Exposure Assessment" -- first off, this is looking</p> <p>19 at a study of rubber workers in the UK, correct?</p> <p>20 A Yes.</p> <p>21 Q The cohort of -- it was male rubber</p> <p>22 factory workers in the UK aged 35 years or older as</p> <p>23 of 1 February 1967, and that's on this Page 251</p> <p>24 under "Materials and Methods"?</p> <p>25 A Uh-huh.</p>
<p style="text-align: right;">Page 66</p> <p>1 NDMA exposed group.</p> <p>2 In other words, for carcinogens -- for</p> <p>3 other carcinogens to introduce this bias for</p> <p>4 measurement in this study, you have to be able to</p> <p>5 show that the NDMA, the highest NDMA category met</p> <p>6 were getting -- were getting more exposure to those</p> <p>7 carcinogens than the control group.</p> <p>8 And I don't think -- in other words,</p> <p>9 there is what we call a differential, sort of,</p> <p>10 measurement. In other words, it's affecting one</p> <p>11 group more, that's why we see more cancers. But</p> <p>12 that's not -- I mean, there's no reason to believe</p> <p>13 that. This is a large population study in the UK.</p> <p>14 All these men are in the factory. They are all</p> <p>15 being exposed to different carcinogens probably at</p> <p>16 the same rate. I mean, there is no -- there is no</p> <p>17 reason to believe that the ND -- the highest NDMA</p> <p>18 group that has -- shows higher cancer rates were</p> <p>19 also exposed to other carcinogens more than the</p> <p>20 other -- they were probably exposed at equal rates.</p> <p>21 Q Okay. Well, let's look at the Hidajat</p> <p>22 studies. That's Exhibit 8.</p> <p>23 And if you look at -- first off, let's</p> <p>24 look at the first page, the right-hand column,</p> <p>25 the -- the last paragraph starts off -- it says,</p>	<p style="text-align: right;">Page 68</p> <p>1 THE COURT REPORTER: Is that yes?</p> <p>2 THE WITNESS: Yes.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q So the first sentence under "Exposure</p> <p>5 Assessment," says, "Exposure assessment was based on</p> <p>6 estimates from the EU-EX-ASRUB database of</p> <p>7 measurements of compounds in rubber factories in</p> <p>8 Europe," right?</p> <p>9 A Uh-huh. Yes.</p> <p>10 Q So this is where they're getting the</p> <p>11 estimates for each of the compounds that they're</p> <p>12 looking at, including NDMA, right?</p> <p>13 A Yes.</p> <p>14 Q Okay. And that's citing to</p> <p>15 Reference Number 18, and if we go forward to</p> <p>16 Page 258 on the right-hand column, you see</p> <p>17 Reference 18. And that's an article by DeVocht as</p> <p>18 the lead author, right?</p> <p>19 A Yeah.</p> <p>20 MR. GALLAGHER: Let's mark as</p> <p>21 Exhibit9 the DeVocht article.</p> <p>22 (Whereupon, Exhibit9 was marked for</p> <p>23 Identification.)</p> <p>24 MR. GALLAGHER: Let me know when it</p> <p>25 shows up in the chat.</p>



<p style="text-align: right;">Page 69</p> <p>1 THE WITNESS: Yeah, it just showed up.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q If we go to Page 694 under -- under</p> <p>4 "Results"?</p> <p>5 A Uh-huh.</p> <p>6 Q And this is explaining that -- well, I</p> <p>7 guess, first off, this is the article that Hidajat</p> <p>8 is citing to as the source of the estimates for</p> <p>9 exposures, including the exposures to NDMA, correct?</p> <p>10 A Yes.</p> <p>11 Q Okay. And under "Results," it's</p> <p>12 describing the EX-ASRUB database and explaining that</p> <p>13 "the measurements in the database have been</p> <p>14 collected from very different sources in the</p> <p>15 participating countries."</p> <p>16 Did I read that correct?</p> <p>17 A That is correct, but they -- they</p> <p>18 do -- there's statistical modeling that is mentioned</p> <p>19 in their method. They do correct for a lot of those</p> <p>20 heterogeneity between country measurements. So I</p> <p>21 found that modeling quite robust. Not that -- not</p> <p>22 that it doesn't have -- I mean, every study has</p> <p>23 limitations, but I found that -- that part of what</p> <p>24 they did was quite strong in terms of correcting for</p> <p>25 those differences that we just mentioned of exposure</p>	<p style="text-align: right;">Page 71</p> <p>1 Q Okay. Then it goes on to say, "For</p> <p>2 example, N-nitrosamine measurements were primarily</p> <p>3 collected in Germany, while in the UK, measurements</p> <p>4 of rubber process dust and rubber fumes were made."</p> <p>5 Do you see that?</p> <p>6 THE COURT REPORTER: I'm sorry. While</p> <p>7 in the UK, measurements of...</p> <p>8 MR. GALLAGHER: Rubber process dust</p> <p>9 and rubber fumes were made.</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q Do you see that?</p> <p>12 A Yes.</p> <p>13 Q So N-nitrosamine measurements were</p> <p>14 primarily coming from exposures in factories in</p> <p>15 Germany? That's where the estimates were coming</p> <p>16 from in DeVocht, correct?</p> <p>17 MR. NIGH: Object to form.</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q Correct? Am I correct -- the</p> <p>20 measurements of N-nitrosamine that are being used in</p> <p>21 DeVocht are primarily collected from rubber</p> <p>22 factories in Germany?</p> <p>23 MR. NIGH: Object to form.</p> <p>24 THE WITNESS: Can I have a few minutes</p> <p>25 just to read this section, if you allow -- if</p>
<p style="text-align: right;">Page 70</p> <p>1 in different countries.</p> <p>2 Q Who -- who did the corrections that</p> <p>3 you're referring to?</p> <p>4 A Well, they used the random effects, if</p> <p>5 you look at the -- if you look at the method -- the</p> <p>6 statistical methods, I believe.</p> <p>7 Q Which article are you looking at?</p> <p>8 A DeVocht.</p> <p>9 Q Doctor, are you referencing -- are you</p> <p>10 talking about DeVocht, or are you talking about</p> <p>11 Hidajat?</p> <p>12 A No, DeVocht.</p> <p>13 Q Maybe let's look on the Page 697, and</p> <p>14 if we can start -- start in the left-hand column,</p> <p>15 the bottom paragraph that's going to then carry over</p> <p>16 to the right-hand column?</p> <p>17 A Okay.</p> <p>18 Q Do you see that, it says, "Not only</p> <p>19 the number of collected measurements and the time</p> <p>20 periods when they were collected differed between</p> <p>21 the different countries, but large differences were</p> <p>22 also found in the type of chemical agents collected</p> <p>23 depending on nationally set priorities and research</p> <p>24 interests of particular investigators," right?</p> <p>25 A I see that.</p>	<p style="text-align: right;">Page 72</p> <p>1 you allow me?</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Sure. Sure. Take a minute.</p> <p>4 A Okay. So, yes, they do -- they do --</p> <p>5 they do list these limitations as you pointed out.</p> <p>6 However, I mean, one can argue that these</p> <p>7 limitations could also potentially underestimate the</p> <p>8 exposure of -- of what they have measured in their</p> <p>9 study.</p> <p>10 And, again, I go back to my original</p> <p>11 point. You're following -- you have 35,000 men for</p> <p>12 about -- sorry, 15,000 men for about 40 years. In</p> <p>13 order to produce results that are a major deviation</p> <p>14 from the risks that they have shown, you have to be</p> <p>15 able to actually show that one group was -- had, you</p> <p>16 know, a major measurement error in other carcinogens</p> <p>17 or NDMA more than the other group because this is a</p> <p>18 population-based study.</p> <p>19 And there is really no reason to</p> <p>20 believe that one group had these limitations and the</p> <p>21 other group did not. It probably occurred</p> <p>22 non-differentially in both groups over a long period</p> <p>23 of time.</p> <p>24 So yes, as they said, the study does</p> <p>25 have some limitations. But I think this limitation</p>

<p style="text-align: right;">Page 73</p> <p>1 does -- could actually mean the risk could be  2 potentially higher because it's smaller -- perhaps,  3 potentially a smaller quantity of NDMA was measured,  4 so the techniques that they were talking about.  5 But overall, I think that the study's  6 strengths, sort of, outweigh its limitations. But,  7 I mean, that is a limitation that they discuss.  8 Q So you say that based on this  9 limitation, they could have -- potentially could  10 have underestimated any potential association, but  11 they are -- based on that limitation -- they also  12 could have overestimated any potential association,  13 right? That's the nature of the limitation?  14 A Yes, it could go both ways, but I --  15 I'm more -- again, I go back to my -- I'm more of a  16 stronger believer in the fact that any major  17 deviation from these results requires, you know, a  18 large amount of measurement error over time only in  19 one group and not the other group. Other  20 limitations could perhaps change the effect size,  21 you know, perhaps a little bit. But I don't see a  22 relative risk of three or four, you know, coming  23 down to one or -- or to the left of one. I don't --  24 I don't see -- without having evidence of any major  25 measurement error going on, I don't see those</p>	<p style="text-align: right;">Page 75</p> <p>1 measurement error and measurement of NDMA in the  2 Hidajat study.  3 A And -- and exposure -- and exposure of  4 other carcinogens, which was also brought up --  5 Q Okay.  6 A -- as well.  7 Q I want to talk for just a minute about  8 the measurement of NDMA.  9 A Okay.  10 Q Hidajat -- Hidajat is a cohort of  11 workers in rubber factories in the UK, right?  12 A Yes.  13 Q Hidajat did not measure the levels of  14 NDMA to which any of -- to which those workers were  15 exposed, right? It was based on estimates from this  16 database, right?  17 A Correct.  18 MR. NIGH: Objection.  19 THE WITNESS: Measuring -- measuring  20 direct NDMA for each subject and following them  21 for 35 years is pretty much impossible, so  22 that's -- that's the approach that they took.  23 BY MR. GALLAGHER:  24 Q Right. But Hidajat didn't take any  25 measurements. Hidajat based -- Hidajat based their</p>
<p style="text-align: right;">Page 74</p> <p>1 results drastically changing.  2 Q Okay. You talked about measurement  3 errors. So talking about the Hidajat study, the  4 Hidajat article?  5 A Yes.  6 Q This is a cohort of men working in  7 rubber factories in the UK.  8 A Right.  9 Q And --  10 A Right. By "measurement" there, I mean  11 if one group is exposed, as you also agreed because  12 of other potential carcinogens, if one group -- if  13 there is a measurement error in NDMA in one group,  14 say, the high users more than the lower users, or if  15 there is more exposure of other carcinogens in one  16 group versus the other, in the presence of those,  17 there -- there could be a bias introduced.  18 But we don't have any evidence that in  19 this long-followed-up large-sample study these  20 errors only favored one group, let's say the high  21 NDMA users and not the -- not the other -- not the  22 control group. There is no evidence to believe  23 that. It probably happened equally over time in  24 both groups.  25 Q Okay. So you're talking about</p>	<p style="text-align: right;">Page 76</p> <p>1 exposure assessment on estimates from the EX-SARUB  2 database.  3 A Yes, I think we've -- we've agreed on  4 that, yes.  5 Q Okay. And now we're looking at  6 DeVocht article, and there, the -- the measurements  7 for N-nitrosamine primarily were collected in  8 Germany, right?  9 MR. NIGH: Form objection.  10 THE WITNESS: Yes.  11 BY MR. GALLAGHER:  12 Q And they say that there were large  13 differences in the time periods and large  14 differences in the type of chemical agents collected  15 depending on nationally set priorities and research  16 interests of particular investigators, right?  17 A Right.  18 Q Okay. Further on here in the next  19 paragraph right below that paragraph, it goes on to  20 say in the DeVocht article, "Furthermore, measured  21 concentrations cannot be compared directly between  22 countries because of the differences in sampling  23 devices used to measure exposures," right?  24 A Yeah. That's what they said, yeah.  25 Q So that's a further limitation.</p>



<p style="text-align: right;">Page 77</p> <p>1 And then -- and then the bottom of  2 this page, it carries over to the next page, they  3 further say, "This makes it difficult to distinguish  4 between actual differences of exposure between  5 countries and differences in the performances of  6 different sampling devices that are known to exist,"  7 right?  8 A Yes.  9 Q So we don't know that the exposures  10 for N-nitrosamine, for NDMA, or for NDEA that were  11 included in this database from the DeVocht article,  12 are representative of the rubber factory that are  13 included -- the rubber factories in the UK that are  14 included in the Hidajat cohort, right?  15 MR. NIGH: Object to form.  16 THE WITNESS: Again, that -- that  17 could -- I mean, I believe this -- we don't. I  18 believe the assumption would be that they  19 are -- I mean, it's Europe -- it's European  20 countries.  21 If -- if they were using NDMA exposure  22 data from China and applying it to the UK, I  23 would be concerned. But, here, yes, they don't  24 have exact measurements for each country. But  25 again, there has to be a huge difference</p>	<p style="text-align: right;">Page 79</p> <p>1 A Yes.  2 Q And that includes rubber dust, rubber  3 fumes, polycyclic aromatic hydrocarbons, aromatic  4 amines, benzene, all of those, correct?  5 A Correct.  6 Q And that exposure is primarily by  7 inhalation or direct contact with skin, right?  8 A Yeah.  9 Q Okay. The -- the Hidajat study  10 didn't -- didn't control for all of these potential  11 confounding exposures, did they?  12 A I wouldn't call them confounders  13 because the specific definition of a confounder is a  14 variable that has to be associated with both NDMA  15 use and cancer. These are mostly risk factors which  16 means that they are mostly causes of cancer.  17 And again, I go back to my point,  18 major -- if you're inferring that these -- yes,  19 these are all carcinogens. That's what IARC says,  20 and I have -- I agree with what they're saying. But  21 if you're inferring that these carcinogens  22 contributed to the high relative risk of cancer that  23 we see from Hidajat based on the high NDMA levels;  24 again, I go back to my explanation of the type of  25 bias that -- that needs to be created, has to be</p>
<p style="text-align: right;">Page 78</p> <p>1 affecting both the high NDMA and the low NDMA  2 groups over 30 years to -- to shift the -- you  3 know, create a major change in the results that  4 Hidajat produced.  5 BY MR. GALLAGHER:  6 Q But that's a limitation that  7 DeVocht -- the authors of the DeVocht article are  8 acknowledging in this database, right?  9 A Yes.  10 Q Let's go back to the Hidajat article,  11 on the first page of the article right under  12 "Introduction."  13 A Okay.  14 Q It says -- starting off the article,  15 first sentence, they say, "Employment in the rubber  16 industry has been concluded to cause cancer by the  17 International Agency for Research in Cancer (IARC)."  18 Do you see that?  19 A Yes.  20 Q Do you have any reason to disagree  21 with that statement?  22 A No.  23 Q And, in fact, rubber -- workers in  24 rubber factories in the UK are exposed to a variety  25 of potential carcinogens, right?</p>	<p style="text-align: right;">Page 80</p> <p>1 differential, meaning that it has to -- we have to  2 have data, or we have to intuitively think that  3 these chemicals are only affecting the NDMA -- high  4 NDMA category and not the control group. And  5 there's no reason to believe that's the case.  6 Most probably, just inferring from  7 what we know from the data from -- from the article  8 of the cancer studies, that this long follow up,  9 these -- these other carcinogens probably affect  10 both the high NDMA -- well, it affects everyone in  11 -- in the study, high NDMA group versus low NDMA  12 group.  13 And when that happens in the  14 epidemiological studies, it usually -- usually is an  15 underestimation of the true effect. In other words,  16 the risk, relative risk is 7, and it comes down to 5  17 because of this error, this potential contamination  18 in both groups, which we call "non-differential  19 measurement error."  20 The bias that you, I think, are  21 referring to is a case where all of these  22 carcinogens are only affecting the high NDMA group  23 and not the other group. And that just doesn't --  24 you know, we don't have any data for that. It  25 doesn't make a lot of sense why that would happen.</p>

<p style="text-align: right;">Page 81</p> <p>1 So to answer your question, yes, a  2 number of these carcinogens were present in this --  3 in this study just because of the nature of the  4 exposure.  5 But I don't think it would have  6 changed the results that much, because of this  7 presence of other carcinogens. Again, because there  8 is no reason to believe that it affects one group  9 and not the other group.  10 Q Well, unless you control for these  11 other exposures, you don't know if there's a  12 differential effect or not?  13 MR. NIGH: Form objection.  14 BY MR. GALLAGHER:  15 Q Correct?  16 A Can you repeat your question, please?  17 Q Unless you control for these other  18 exposures, you don't know whether there's a  19 differential effect or not?  20 MR. NIGH: Form objection.  21 THE WITNESS: Well, I mean, it's --  22 it's gonna be very difficult to measure for all  23 of these variables. And, again, they're not --  24 we -- we control for -- we control for mainly  25 confounders. I'm not sure if all of these are</p>	<p style="text-align: right;">Page 83</p> <p>1 carcinogens and half of them are not, how do you  2 separate which ones are, if you haven't controlled  3 for those different -- for those exposures?  4 MR. NIGH: Form objection.  5 THE WITNESS: Again, that's -- that's  6 very difficult to do. And, again, I go back to  7 my previous point: In a large cohort of 15,000  8 men with 35 years of follow up, you have to  9 show consistently that the other carcinogens is  10 only affecting the high NDMA users, through the  11 35 years of follow up constantly in order for  12 the effect of -- of other -- the other  13 carcinogens to be reflected in the relative  14 risk. That -- we don't have any data that  15 that's happening. It doesn't make intuitive  16 sense.  17 It makes sense that these men are  18 exposed to these carcinogens, but in the span  19 of a 35-year follow-up, it's probably affecting  20 both the high NDMA and the low NDMA equally.  21 And when that happens, that actually dilutes  22 the -- the -- the relative risk that you're  23 seeing.  24 So, again, we don't have -- there's no  25 way to measure all the -- all these agents that</p>
<p style="text-align: right;">Page 82</p> <p>1 confounders in the true sense of the term,  2 which is a variable that affects both the  3 outcome and the exposure.  4 There are mainly risk factors, and  5 risk factors are not -- not controlling for  6 risk factors is not as detrimental as not  7 controlling for confounders.  8 This is -- this is a very -- you know,  9 it's a very difficult study to execute, and  10 there's no -- there is no way to control for  11 all of those variables. And I'm not -- again,  12 I'm not sure if -- they're not true  13 confounders, I'm not sure -- not controlling  14 for them would affect the results, or at least  15 a direction of the results, that much.  16 BY MR. GALLAGHER:  17 Q Okay. Understanding the distinction  18 you're making between exposures to these other  19 potential carcinogens and confounders, let's talk  20 first about these other potential exposures. And  21 we'll talk about confounders in a few minutes.  22 If the workers in a specific area of  23 the rubber factory in -- in the UK are exposed to  24 rubber fumes, polycyclic aromatic hydrocarbons,  25 aromatic amines and NDMA, and half of those are</p>	<p style="text-align: right;">Page 84</p> <p>1 you mentioned for all these men and follow them  2 for the 35 years. But because I don't believe  3 it's affecting one group more than the other, I  4 don't -- I don't see a major -- this potential  5 limitation leading to a major bias.  6 BY MR. GALLAGHER:  7 Q Well, you say you don't believe it's  8 affecting one group more than another, but that's an  9 assumption you're making, right?  10 MR. NIGH: Object to form.  11 THE WITNESS: It's not just an  12 assumption. It's -- I mean, it's -- it's based  13 on the -- the information you're given, this  14 is -- this is rubber factory workers, 35 years  15 of follow-up in the UK. And we are not  16 giving -- we are not given any information  17 that, you know, all of a sudden, this cohort,  18 or at least part of the cohort, is exposed to  19 this other carcinogen more, you know, in the  20 high -- especially in the high NDMA group more  21 than the other, the control group.  22 So I -- I feel comfortable with the  23 assumption because I -- I just can't see any  24 sort of a logical reason as to why that would  25 happen. It's a -- it's a large population</p>

<p style="text-align: right;">Page 85</p> <p>1 based study on the same cohort in the same</p> <p>2 country followed forward for 35 years.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q Can we go for just a minute to your</p> <p>5 invoices again, which is Exhibit 4, I think? Is</p> <p>6 that right? Exhibit 4.</p> <p>7 And if we look at Page 3 of 5, this is</p> <p>8 an invoice from May 5th of 2021.</p> <p>9 Do you see the -- there's three</p> <p>10 entries on this invoice. The bottom entry looks</p> <p>11 like you spent three hours searching for</p> <p>12 methodologies to control for unmeasured confounding</p> <p>13 for the Hidajat study. Do you see that?</p> <p>14 A Yes.</p> <p>15 Q Why were you searching for</p> <p>16 methodologies to try to control for unmeasured</p> <p>17 confounding in the Hidajat study?</p> <p>18 A Because I wanted to show how robust</p> <p>19 the -- the results would be in the absence of one</p> <p>20 uncontrolled confounder.</p> <p>21 Q When you're saying you want to show</p> <p>22 how robust it is, you're assuming that the results</p> <p>23 are robust, but for unmeasured confounding factors,</p> <p>24 right?</p> <p>25 MR. NIGH: Form objection.</p>	<p style="text-align: right;">Page 87</p> <p>1 MR. NIGH: Form, form objection.</p> <p>2 THE WITNESS: No, I -- I used the</p> <p>3 E-value methodology which I had -- I have used</p> <p>4 actually before in my -- in my research</p> <p>5 studies. I just wanted to do another search</p> <p>6 just to see if there is any newer or perhaps</p> <p>7 better methodology than the E-value</p> <p>8 methodology. And I found that there isn't any,</p> <p>9 so I used the method that I have used, you</p> <p>10 know, a number of times in the past in my own</p> <p>11 research.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Okay. If we look at your report,</p> <p>14 Page 15?</p> <p>15 A Yes.</p> <p>16 Q And is this -- is this table part of</p> <p>17 what you're referring to in terms of looking at the</p> <p>18 effect of unmeasured confounders?</p> <p>19 A Yes.</p> <p>20 Q And walking through the table on the</p> <p>21 left-hand column, you've listed different specific</p> <p>22 types of cancer, right?</p> <p>23 A Yes.</p> <p>24 Q And in the middle column, you --</p> <p>25 you're listing hazard ratios without unmeasured</p>
<p style="text-align: right;">Page 86</p> <p>1 THE WITNESS: Well, let me put it,</p> <p>2 then, another way. I wanted to know if there</p> <p>3 is -- how much change -- how much the results</p> <p>4 would change when I include -- when I</p> <p>5 assimilate this unmeasured confounder into the</p> <p>6 results.</p> <p>7 BY MR. GALLAGHER:</p> <p>8 Q Okay. And in order to do that, you</p> <p>9 had to go search for methodologies to control for</p> <p>10 those unmeasured confounders, right?</p> <p>11 A Yes.</p> <p>12 MR. NIGH: Form -- form objection.</p> <p>13 BY MR. GALLAGHER:</p> <p>14 Q It's not something that you -- you had</p> <p>15 a methodology that you -- you -- that you typically</p> <p>16 use, yourself, in your -- in your research?</p> <p>17 MR. NIGH: Form objection.</p> <p>18 THE WITNESS: Can you repeat the</p> <p>19 question, please?</p> <p>20 BY MR. GALLAGHER:</p> <p>21 Q You had to go search for methodologies</p> <p>22 because you didn't have -- you didn't have a</p> <p>23 methodology that you typically used for this type of</p> <p>24 looking at potential effects of unmeasured</p> <p>25 confounders, right?</p>	<p style="text-align: right;">Page 88</p> <p>1 confounder. Where are you getting those numbers</p> <p>2 from?</p> <p>3 A So by using this methodology that's</p> <p>4 published, if you include -- there is a formula</p> <p>5 where you include the -- for example, the stomach</p> <p>6 cancer is 1.72. If you include this in this</p> <p>7 formula, it tells you how large that unmeasured</p> <p>8 confounder has to be to eliminate the risk of 1.72.</p> <p>9 So you can see for all the other</p> <p>10 cancers -- all the cancers listed, the -- the</p> <p>11 magnitude of the effect of that confounder has to be</p> <p>12 pretty large to reverse the -- the relevant risks on</p> <p>13 the left-hand column.</p> <p>14 Q So I guess -- let me walk through it</p> <p>15 this way.</p> <p>16 The left-hand column, those are -- are</p> <p>17 reporting hazard ratios that are coming from the</p> <p>18 Hidajat study; is that right?</p> <p>19 A That's right.</p> <p>20 Q Okay. And then in the right-hand</p> <p>21 column is where you're now calculating what -- what</p> <p>22 the hazard ratio for an unmeasured confounder would</p> <p>23 need to be in order to take the relative risk in the</p> <p>24 left-hand column down to one; is that right?</p> <p>25 A Correct.</p>

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1 Q Okay. And Hidajat, they did not  
2 directly control for smoking, right?  
3 A They did not, although -- they did  
4 not, although they said they simulated smoking data,  
5 and the results did not change.  
6 Q They simulated smoking data, but they  
7 didn't control for smoking, right?  
8 A No.  
9 Q Would you consider smoking to be a  
10 potential confounder?  
11 A So smoking is definitely a risk factor  
12 for cancer, and smoking, in order for it to be a  
13 confounder, has to also be potentially associated  
14 with NDMA exposure. So it could potentially be  
15 confounded, yes.  
16 Q Okay. And another potential  
17 confounding factor would be family history of  
18 cancer?  
19 A Yes, family history of cancer --  
20 again, so the family history of cancer is definitely  
21 a risk factor for cancer. Whether people with  
22 family history of cancer are more likely to be  
23 exposed to NDMA, that, you know, that side of the  
24 triangle, I'm not sure it's possible. But then  
25 again, for that confounder to introduce bias, it has

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1 to -- it's dependent on how prevalent that  
2 confounder is in that population and how strong the  
3 confounder cancer and confounder NDMA relationship  
4 is. So just the absence of a confounder does not  
5 mean that necessarily the study is biased, if a  
6 confounder has to, you know, a number of criteria  
7 have to be met for that unmeasured confounder to  
8 actually -- as I have demonstrated in my table, to  
9 cause bias in the results.  
10 But theoretically, it could be a  
11 potential confounder.  
12 Q Okay. And Hidajat did not control for  
13 family history of cancer?  
14 A No.  
15 Q Correct?  
16 A No.  
17 Q Are you aware that infection with  
18 H. pylori is a potential risk factor for certain  
19 types of cancer?  
20 A Again, it is a risk factor but it's  
21 not necessarily a confounder, because H. pylori is  
22 not really associated with NDMA exposure.  
23 So not having H. pylori is not going  
24 to really bias the results because it's not a  
25 confounder. It's a risk factor. However, I don't

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1 really see it as a major bias. Plus, again, it has  
2 to be differential between the two groups, even if  
3 it were a confounder.  
4 So I don't -- yes, H. pylori was not  
5 measured. And it is -- it is a risk factor for  
6 mainly actually stomach cancer, but it is a risk  
7 factor of cancer. But it's not -- I don't believe  
8 it's necessarily a confounder because it doesn't  
9 meet the H. pylori NDMA length in the triangle, in  
10 the causal triangle.  
11 Q Well, again, unless you control for  
12 it, you don't know if there's differential exposure  
13 between --  
14 A Well, first -- first of all, it's not  
15 a confounder, so even if it's differential or not  
16 differential, because it's not a confounder, it  
17 should not really change the results. Smoking is a  
18 confounder. We talked about it because it satisfies  
19 the confounder definition, but H. pylori, you know,  
20 at first glance, it seems, like, oh, we should  
21 control for it because it's a risk factor for  
22 cancer. But it's not really -- it's not really  
23 associated with NDMA users. It's a relatively  
24 prevalent infection that many people have. So I  
25 don't really -- I don't really see how -- not

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1 measuring H. pylori could really change the results.  
2 Q What's the distinction that you see  
3 between smoking and infection with H. pylori, if  
4 smoking is a confounder but H. pylori infection is  
5 not?  
6 A Smoking is a confounder because it's  
7 associated with cancer, and since it's probably  
8 associated with NDMA because these are -- rubber  
9 factory workers in the '60s and '70s and, you know,  
10 that -- that sort of profession. Especially back  
11 then, they were probably smokers. So it meets  
12 the -- the dual criteria of a confounder.  
13 H. pylori only has one arrow to  
14 cancer, but it doesn't really have an arrow to NDMA  
15 in any way. It's not really associated with NDMA,  
16 so that's why it's only one arrow to cancer that  
17 makes it a risk factor and not a confounder.  
18 Q Do you agree with me that if the  
19 members of the cohort from the Hidajat study who  
20 were classified -- who were classified by them as  
21 high NDMA were more likely to have H. pylori  
22 infection than the members of the cohort that were  
23 classified as low NDMA exposure, if that would skew  
24 the results?  
25 MR. NIGH: Form objection.

<p style="text-align: right;">Page 93</p> <p>1 THE WITNESS: No. Again, what you're 2 talking about in terms of one group having more 3 than the other is -- again, it's for 4 confounders. So if you have a confounder 5 that's showing up more in one group than the 6 other, that confounder is probably biasing the 7 results, and you have to do an analysis where 8 you stratify by that confounder to make things 9 clean. 10 H. pylori is not a confounder, and so 11 even if one group had it more than the other, 12 which we don't really believe is the case, 13 would not really change, because it's -- 14 because it cannot change -- it's not affecting 15 the exposure. It's only affecting the outcome. 16 It wouldn't change the results, I don't believe 17 so. 18 BY MR. GALLAGHER: 19 Q If there was a difference in the -- in 20 the percentage of the cohort for high NDMA exposure 21 that had H. pylori infection versus the percentage 22 of the cohort classified as low NDMA that had 23 H. pylori infection, you don't think that that would 24 have any impact on -- 25 A The --</p>	<p style="text-align: right;">Page 95</p> <p>1 wouldn't have any impact. I would say it 2 would -- it would affect maybe the precision, 3 maybe a relative risk of say 5 to a 4. But it 4 wouldn't reverse the direction of that -- that 5 effect size. It wouldn't take a 4 to a .5, 6 which confounders could -- could do. 7 This is just a risk factor. So 8 absence of a risk factor could slightly change 9 the precision, but it wouldn't change the 10 direction of the -- of the effect size in 11 Hidajat. 12 BY MR. GALLAGHER: 13 Q So you agree it could impact the 14 observed hazard ratio? 15 A In the -- in the way that I just 16 explained, yes. 17 Q So if we look at the table, you -- you 18 say it could go theoretically from a hazard ratio of 19 5 to a hazard ratios of 4 -- 20 A It could -- it could, but it could be 21 even lower because it has -- you know, there's such 22 a huge sample size. But it's possible to affect 23 precision of the -- of the effect size. 24 Q Okay. So if we look at your table, 25 for stomach cancer, you're showing a hazard ratio</p>
<p style="text-align: right;">Page 94</p> <p>1 MR. NIGH: Hold on. Hold on. He 2 didn't finish his question. 3 Did you finish, Mr. Gallagher? 4 MR. GALLAGHER: I did, yeah. 5 MR. NIGH: Okay. Form objection. 6 THE COURT REPORTER: I didn't hear the 7 end of the question, just the very end. 8 MR. GALLAGHER: Let me rephrase it. 9 BY MR. GALLAGHER: 10 Q Dr. Etminan, is it your opinion that 11 if -- if there was a difference in the percentage of 12 the cohort Hidajat classified as high NDMA exposure 13 that had H. pylori infection versus the percentage 14 of the cohort classified by Hidajat as low NDMA 15 exposure that has H. pylori infection, that -- that 16 would not have any impact on the results -- 17 A I -- 18 MR. NIGH: Hold on. Hold on. Hold 19 on. I'm not sure if he's done. 20 BY MR. GALLAGHER: 21 Q That would not have any impact on the 22 results of the study? 23 MR. NIGH: Form objection. 24 Go ahead, Doctor. 25 THE WITNESS: Well, I wouldn't say it</p>	<p style="text-align: right;">Page 96</p> <p>1 without a measured -- a measured confounder of 2 1.782. Why couldn't it go from 1.72 to 1? 3 A No. I think -- I think you're just -- 4 I mean, that's -- that's speculation. I could also 5 go to 1.4. I'm just making a general statement that 6 because H. pylori is mainly a risk factor, provided 7 that there is a huge differential in the -- in the 8 level in the measurement of H. pylori between the 9 high NDMA group versus the low NDMA group, there 10 could be changing precision of the hazard ratio, but 11 not a -- not a reversal of the direction of the 12 hazard ratio. 13 Q Okay. Let's look at the Hidajat 14 study, Exhibit 8. 15 THE VIDEOGRAPHER: Counsel, there's 16 about 10 minutes left on this media unit. 17 MR. GALLAGHER: Okay. Thanks. 18 BY MR. GALLAGHER: 19 Q At Page 251, again, under "Exposure 20 Assessments" -- 21 MR. NIGH: I'm sorry. Why are we 22 having to -- to break for a media? I haven't 23 seen that with any other court reporter. 24 MR. GALLAGHER: It has happened in 25 the -- in the other depositions.</p>



<p style="text-align: right;">Page 97</p> <p>1 MR. NIGH: The other -- you mean the  2 other depositions using Veritext? Because I  3 don't think that we need to be breaking to  4 switch tapes. This is being done via Zoom, and  5 it's being recorded via Zoom. I just don't  6 understand why we would -- why we would break  7 unnecessarily.  8 MR. GALLAGHER: Let me finish up for  9 10 minutes, and then we can talk about that.  10 BY MR. GALLAGHER:  11 Q So looking under "Exposure  12 Assessments" --  13 A Okay.  14 Q -- we had looked at this earlier, that  15 the -- the measurements of NDMA are based on  16 estimates from a database. And then further on,  17 about halfway through this paragraph, it says,  18 "Because only job information in 1967 was available,  19 the primary analyses assumed all subjects remained  20 in the same factory department, i.e., not  21 necessarily in the same job, throughout their  22 careers and were employed until retirement at age  23 70, death or immigration."  24 Do you see that?  25 A Yeah.</p>	<p style="text-align: right;">Page 99</p> <p>1 factories, because job information was only  2 available for one year, 1967, the authors assumed  3 that all the subjects stayed in the same factory  4 department throughout their career. But they don't  5 know if any of these workers moved -- moved around  6 to various different departments?  7 A So, I mean, obviously, it's  8 challenging to keep track of people -- people's  9 occupation for 35 years. However, I think they took  10 this issue seriously, and they do mention that they  11 did sensitivity analyses looking at different  12 duration of employment. And they mentioned that  13 that didn't change the results.  14 Q So I understand that they did some  15 sensitivity analyses around duration of employment,  16 but they're still assuming that for the duration of  17 employment, each subject is staying in the same  18 factory department, right?  19 A Yeah. There is that assumption, but  20 at least, you know, the sensitivity analysis of the  21 different duration of employment, I believe is  22 reassuring. But, yes, the assumption is that they  23 did stay in that -- in that employment for -- for  24 the amount of time.  25 Q So the sensitivity -- sensitivity</p>
<p style="text-align: right;">Page 98</p> <p>1 Q So in addition to NDMA not actually  2 being measured but being based on estimates from  3 primarily German factories, in Hidajat, in this  4 cohort, they didn't know what part of the factory  5 these individuals were actually working in. They  6 only had job information for one year, and they  7 assumed that they stayed in the same department,  8 right?  9 A Can I just have a few minutes to read  10 this, if you don't mind?  11 Q Sure.  12 A I'm actually going to look at Hidajat  13 at the very end in the discussion.  14 Q Sure, what --  15 A What was the exhibit number again for  16 Hidajat?  17 Q Exhibit 8.  18 A Okay. Just one second, please.  19 Q Sure.  20 A Okay. So would you please repeat your  21 question?  22 Q Sure.  23 So in addition to not actually  24 measuring NDMA but relying on estimates that came  25 primarily from measurements of German rubber</p>	<p style="text-align: right;">Page 100</p> <p>1 analysis around duration of employment, I understand  2 that addresses the duration of employment, but that  3 doesn't address this assumption that all the  4 subjects are staying in the same department.  5 MR. NIGH: Form objection.  6 THE WITNESS: I mean, I'm not sure,  7 honestly, whether different departments would  8 have different exposure to NDMA over a 35-year  9 period. But that -- that's -- I mean, that's  10 just the nature of the study. And that's what  11 they mention. Again, it -- the exposure of  12 NDMA in the different departments for it to  13 change a major cause and major bias in the  14 study, it has to be quite big and only  15 affecting one group as -- as we talked about  16 with other types of carcinogens, to maintain --  17 to change the direction of these results.  18 BY MR. GALLAGHER:  19 Q So if we go back to the first page of  20 Hidajat, the right-hand column, bottom paragraph,  21 the authors expressly say, "Exposures vary  22 throughout the rubber manufacturing process."  23 A Exposures do vary, but my -- I think  24 my point was exposure has to vary in one group, the  25 high NDMA, for -- constantly for long periods, and</p>



<p style="text-align: right;">Page 101</p> <p>1 they don't have to -- and they shouldn't vary or  2 stay static in the control group for a long period  3 for this -- for this bias to be introduced. If  4 exposure -- varied exposure happens randomly through  5 the population of these men in 35 years, again, that  6 could maybe affect the precision a little bit then.  7 But it shouldn't change the direction of the -- of  8 the risk.  9 Q But you're assuming the exposure to  10 NDMA. And what the -- the authors are admitting on  11 Page 251 is they only have job information for one  12 year. So they're assuming that all subjects stayed  13 in the same department. They don't -- they don't  14 know if they moved.  15 MR. NIGH: Form objection.  16 BY MR. GALLAGHER:  17 Q Right?  18 MR. NIGH: Form objection.  19 THE WITNESS: They don't know if they  20 moved, yeah.  21 BY MR. GALLAGHER:  22 Q Okay. And then additionally, if we go  23 forward to Page 257, the right-hand column, the  24 paragraph just above "Conclusions." So in this  25 paragraph, Hidajat is acknowledging several</p>	<p style="text-align: right;">Page 103</p> <p>1 mentioning that there could be  2 cross-contamination, they would maybe elaborate  3 that the cross-contamination has affected these  4 results because -- and they don't say that.  5 And I don't have any reason to believe there  6 was a major differential contamination in one  7 group versus the other group.  8 BY MR. GALLAGHER:  9 Q So -- but, again, this is impacting  10 the actual measurement, so if we go back to the  11 first page again, that paragraph we were just  12 looking at, that says, "Exposures varied throughout  13 the rubber manufacturing process." And then they go  14 on to say, "Rubber dust tends to have the highest  15 exposure in the beginning of the production process,  16 particularly in handling of raw materials," right?  17 A Right.  18 Q And then, "Rubber fumes and  19 N-nitrosamines are generated during the heating and  20 curing processes," right?  21 A Right.  22 Q So Hidajat is basing their exposure to  23 NDMA on the estimates of exposures in the various --  24 in the various parts of the factory, right?  25 A Right.</p>
<p style="text-align: right;">Page 102</p> <p>1 limitations of -- of the study, right?  2 A Uh-huh.  3 Q Including the final sentence,  4 "Finally, cross-contamination between departments  5 cannot rule out the need for multi-pollutant  6 models," right?  7 A Yeah.  8 Q "But given the high correlations  9 between exposures, this requires different and  10 complex statistical modeling with currently unknown  11 validity in this context," right?  12 MR. NIGH: Form objection.  13 THE WITNESS: Right. Again, I go back  14 to my -- the point that I have been repeating,  15 the cross-contamination, for it to change the  16 direction of the results, has to be  17 differential only in one group. And I think  18 they are just -- they are just listing one of  19 the limitations that the study in general. But  20 for this cross-contamination to change the  21 consistent -- the increased risk of cancer in  22 this study, it has to be a major differential  23 factor. And I -- I believe that if it was, the  24 authors would mention that in their limitations  25 as well. Rather than just, you know,</p>	<p style="text-align: right;">Page 104</p> <p>1 MR. NIGH: Form objection.  2 BY MR. GALLAGHER:  3 Q They're not -- they're not actually  4 measuring what the exposure to NDMA is, right?  5 A Well, I mean, I don't think that's --  6 that's very, very difficult to do, so they are using  7 the estimates. I think we have talked about this  8 already.  9 Q Sure. And the limitation that they're  10 acknowledging is potential for cross-contamination  11 between departments. So if there was contamination  12 of rubber dust into the department that was doing  13 the heating and curing processes, that would have a  14 huge impact on the assumption that the people in the  15 heating and curing processes are the ones most  16 highly exposed to N-nitrosamines and basing their  17 conclusions of the hazard ratios off of that, right?  18 MR. NIGH: Form objection.  19 THE WITNESS: Again, that  20 cross-contamination has to be sustained for  21 duration of the followup and only in the  22 NDMA -- high NDMA category, to cause the type  23 of bias that you're talking about.  24 BY MR. GALLAGHER:  25 Q So that's what I'm saying, is the</p>

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<p>1 cross-contamination would, because the high ND --</p> <p>2 they're classifying people in the cohort as either</p> <p>3 high NDMA or low NDMA based on where they're working</p> <p>4 in the -- in the factory; is that right?</p> <p>5 MR. NIGH: Form objection.</p> <p>6 BY MR. GALLAGHER:</p> <p>7 Q In other words, that's their</p> <p>8 assumption. If there's actually cross-contamination</p> <p>9 into that department of, for example, rubber dust,</p> <p>10 just to use one, then their -- their assumptions --</p> <p>11 or their assignment of those individuals being high</p> <p>12 NDMA, it is directly impacting 100 percent of those</p> <p>13 people, differentially?</p> <p>14 MR. NIGH: Form objection,</p> <p>15 argumentative.</p> <p>16 THE WITNESS: Yeah. I don't -- I'm</p> <p>17 not sure if I agree with that. I mean, that's</p> <p>18 -- that's -- I think that's quite a stretch of</p> <p>19 what -- what could have happened. There is</p> <p>20 no -- I mean, I think you're just -- I mean,</p> <p>21 you're -- you're coming up with an assumption.</p> <p>22 But I don't -- I mean, even in this -- the</p> <p>23 limitations of their study, they don't mention</p> <p>24 such a huge limitation as a potential reason</p> <p>25 for the results that they found.</p>	<p>1 that we can't even get an explanation for.</p> <p>2 MR. GALLAGHER: Can we go off the</p> <p>3 record and discuss that?</p> <p>4 MR. NIGH: No. No. I want this on</p> <p>5 the record because I want to be arguing that if</p> <p>6 we're going to have 10 hours of record time,</p> <p>7 that we need to be getting through the</p> <p>8 deposition, not taking breaks just because</p> <p>9 there's a limitation in terms of tape time.</p> <p>10 This should not be -- this should not be a</p> <p>11 limitation for a Zoom deposition. We're ready</p> <p>12 to continue forward.</p> <p>13 THE VIDEOGRAPHER: Counsel, there's</p> <p>14 one minute.</p> <p>15 THE COURT REPORTER: Your court</p> <p>16 reporter needs a break.</p> <p>17 MR. NIGH: This is all coming out now</p> <p>18 in response to the tapes. I can tell. So you</p> <p>19 know we -- we need to be getting through this</p> <p>20 deposition, and now -- now, we're -- it is --</p> <p>21 this prompt was clearly because of tapes.</p> <p>22 That's what I heard. That's what started the</p> <p>23 whole thing. Now, it's sounding to me like</p> <p>24 other people are weighing in to try to save</p> <p>25 this response on the tapes. This happened</p>
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<p>1 THE VIDEOGRAPHER: Counsel, there's</p> <p>2 about three minutes remaining.</p> <p>3 MR. GALLAGHER: Okay. Why don't we go</p> <p>4 ahead and take a break?</p> <p>5 MR. NIGH: I'm sorry. Are we taking a</p> <p>6 break because there's three minutes remaining</p> <p>7 on tape? Because we're -- we're ready to keep</p> <p>8 going. I mean, if this is going to be 10 hours</p> <p>9 of record time to have interruptions just</p> <p>10 because there's a certain amount of record, you</p> <p>11 know, tape time, this is not an interruption</p> <p>12 that we've had for any other court reporter.</p> <p>13 And I don't understand why we would have it</p> <p>14 here.</p> <p>15 We have not had this for any of our</p> <p>16 depositions that the plaintiffs have taken of</p> <p>17 custodial depositions. And frankly, I think</p> <p>18 that this is not a reason to take a break. I</p> <p>19 want to us continue forward at this time.</p> <p>20 Dr. Etminan, can you continue? Do you</p> <p>21 want to continue forward?</p> <p>22 MR. GALLAGHER: Let's take a break.</p> <p>23 MR. NIGH: No. No. No. We don't</p> <p>24 just take a break because -- because there's a</p> <p>25 limitation for -- for tapes for some reason</p>	<p>1 multiple times in other depositions, and that's</p> <p>2 exactly what I think the record is going to</p> <p>3 show here as well. We can go ahead and take a</p> <p>4 break.</p> <p>5 THE VIDEOGRAPHER: The time is now</p> <p>6 1:57. This is the end of Media Number 2.</p> <p>7 We're going off the record.</p> <p>8 (Whereupon, a short break was taken.)</p> <p>9 THE VIDEOGRAPHER: The time is now</p> <p>10 11:13. This begins Media Unit Number 3. We're</p> <p>11 back on the record.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Okay. Dr. Etminan, looking at the</p> <p>14 Hidajat article again, Exhibit 8, it's the sentence</p> <p>15 starting on the first page, very bottom of the first</p> <p>16 page. It's only two words, "Due to," and then</p> <p>17 moving on to the beginning of the second page,</p> <p>18 Page 251, the author states, "Due to the complexity</p> <p>19 of exposure pattern and the numerous chemicals used</p> <p>20 in the rubber production process, this entangling</p> <p>21 exposure response associations between specific</p> <p>22 suspected carcinogens and cancer risks in this</p> <p>23 industry remains difficult."</p> <p>24 Do you see that?</p> <p>25 A Yes.</p>

<p style="text-align: right;">Page 109</p> <p>1 Q And so the authors are acknowledging  2 that while working in the rubber industry may be a  3 significant risk of cancer, using occupational  4 studies of the rubber industry to evaluate exposure  5 response associations for a specific suspected  6 carcinogen is something that's difficult to do,  7 right?</p> <p>8 MR. NIGH: Form objection.</p> <p>9 THE WITNESS: Yes. That's what they  10 say. But I think that part of -- part of what  11 they're saying is to kind of strengthen their  12 case as to why they did this study. I mean,  13 this is in their introduction. But I mean, as  14 a general statement, I -- I agree with -- with  15 what is said.</p> <p>16 BY MR. GALLAGHER:</p> <p>17 Q Okay.</p> <p>18 MR. GALLAGHER: If we can move on now  19 to the next exhibit, are we at 10, Exhibit 10,  20 the Lavecchia article?</p> <p>21 THE COURT REPORTER: Can you spell  22 that?</p> <p>23 MR. GALLAGHER: Sure. Lavecchia,  24 L-a-v-e-c-c-h-i-a.</p> <p>25 THE COURT REPORTER: Thank you.</p>	<p style="text-align: right;">Page 111</p> <p>1 to go off the record so that Counsel could  2 substitute the "Nitrosamine Intake and Gastric  3 Cancer Risk" abstract for the full study.</p> <p>4 Do you disagree that's the reason we  5 just went off the record, Mr. Gallagher?</p> <p>6 MR. GALLAGHER: I don't understand  7 your -- your -- all your troubles about taking  8 breaks. I've never been in a deposition where  9 we didn't take breaks for the court reporter,  10 for the witness, for everybody, so --</p> <p>11 MR. NIGH: I have been in many  12 depositions where --</p> <p>13 MR. GALLAGHER: -- we can take a  14 break --</p> <p>15 MR. NIGH: I have been in many  16 depositions where we've -- especially expert  17 depositions, where we have been able to go  18 two hours at a time, and where the expert is  19 at-will to be able to take the breaks.</p> <p>20 At this point, the expert has not  21 asked for a single one of these breaks that  22 we've had at this point. And so, yes, I am  23 concerned about excessive breaks when we have  24 10 hours of record time. That leads to many  25 hours of not record time.</p>
<p style="text-align: right;">Page 110</p> <p>1 (Whereupon, Exhibit 10 was marked for  2 Identification.)</p> <p>3 THE WITNESS: I have it.</p> <p>4 BY MR. GALLAGHER:</p> <p>5 Q Okay. You relied on this study for  6 your opinions related to gastric cancer; is that  7 right?</p> <p>8 A Yes. This is just the abstract,  9 though. It's not the full PDF.</p> <p>10 Q Right. Let me correct that.</p> <p>11 MR. GALLAGHER: Okay. Can we go off  12 the record for just one minute.</p> <p>13 THE VIDEOGRAPHER: Sure. The time is  14 now 11:17. We're going off the record.</p> <p>15 (Whereupon, a discussion was held off  16 the record.)</p> <p>17 (Whereupon, Exhibit 11 was marked for  18 Identification.)</p> <p>19 THE VIDEOGRAPHER: The time is now  20 11:19. We're back on the record.</p> <p>21 BY MR. GALLAGHER:</p> <p>22 Q Dr. Etminan --</p> <p>23 MR. NIGH: Hold on. Before you ask --  24 ask a question, I want to put on the record  25 that we just had to take a three-minute break</p>	<p style="text-align: right;">Page 112</p> <p>1 MR. GALLAGHER: But --</p> <p>2 MR. NIGH: No. You asked why I'm  3 concerned. I am concerned. So here we just  4 had another break that was not anything asked  5 for by the witness. It was yet again you,  6 Mr. Gallagher, here that just had the wrong  7 document. All I wanted to do was put the  8 reason for the break on the record. I asked if  9 it was true. Do you agree that that was the  10 reason for the break?</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q Dr. Etminan, do you have in front of  13 you Exhibit 11?</p> <p>14 A Yes.</p> <p>15 Q And this is the Lavecchia article?</p> <p>16 A Yes.</p> <p>17 Q And you relied on this study in  18 relation to your opinions related to NDMA and  19 gastric cancer in this case, right?</p> <p>20 A Right.</p> <p>21 Q If you look at the abstract on the  22 first page, the last sentence, you will see it says,  23 "Limitations of exposure assessment and absence of  24 information on other N-nitrosamines preclude,  25 however, any definite assessment of the possible</p>

<p style="text-align: right;">Page 113</p> <p>1 role of exogenous N-nitrosamines in gastric 2 carcinogenesis." 3 Do you see that? 4 A Yes. 5 Q And so the -- the authors are 6 acknowledging that they can't make any definitive 7 assessment of an association between exogenous 8 N-nitrosamines and stomach cancer because of that 9 limitation, right? 10 MR. NIGH: Form objection. 11 THE WITNESS: That's -- that's what 12 they're suggesting, yes. 13 BY MR. GALLAGHER: 14 Q Okay. And they refer here to 15 specifically exogenous N-nitrosamines, right? 16 A Yes. 17 Q Do you have an understanding of the 18 distinction between endogenous NDMA and exogenous 19 NDMA? 20 A To -- to -- you know, to certain 21 levels, yes. 22 Q Okay. You haven't addressed anywhere 23 in your report the -- the -- any potential impact of 24 endogenous NDMA, have you? 25 MR. NIGH: Form objection.</p>	<p style="text-align: right;">Page 115</p> <p>1 include it in your report or address it because it 2 was complex? 3 A I mean, again, it's very hard to 4 quantify and discuss it in most of the studies that 5 I looked at it, and there's a lot of them. It 6 wasn't really mentioned or measured, so for the 7 whole host of reasons, that's why I mainly focus on 8 exogenous NDMA. 9 MR. NIGH: And I object to the form of 10 the last question. 11 BY MR. GALLAGHER: 12 Q Looking at the left-hand column here 13 on Page 472, the sentence right above the last 14 paragraph starting with, "However," the authors say, 15 "However, we had no information on endogenous 16 N-nitroso compound formation, which is influenced by 17 gastric PH levels and other complex factors 18 including microbial species in the mouth and 19 stomach, N-nitrosation inhibitors besides subjective 20 individual variation." 21 Do you see that? 22 A Yes. 23 Q So the -- the authors of the Lavecchia 24 study acknowledge the potential issues with not 25 having information on endogenous N-nitroso compound</p>
<p style="text-align: right;">Page 114</p> <p>1 THE WITNESS: No, because it's -- it's 2 very difficult to quantify and ascertain 3 endogenous NDMA exposure. I'm not familiar 4 with any sort of robust gold standard, if you 5 will, method to do it, because it's so complex. 6 But then again back to what we discussed 7 before, endogenous NDMA, you have to have a 8 good reason why one group -- endogenous NDMA 9 can be -- we can all be exposed to endogenous 10 NDMA. It's a very complex sort of process to 11 quantify. 12 But then, again, how can we actually 13 say that one group in this study is exposed to 14 more endogenous NDMA than the other? And 15 that's -- and why -- and there's no reason to 16 believe that's the case. So that's -- that's 17 why I didn't discuss it in my report. 18 BY MR. GALLAGHER: 19 Q Okay. Why don't we turn to Page 472 20 of this article? 21 So, Dr. Etminan, you say that there's 22 a lot of complex factors that can influence 23 endogenous NDMA; is that right? 24 A Yes. 25 Q Okay. And that's why you didn't</p>	<p style="text-align: right;">Page 116</p> <p>1 formation influenced by all these complex factors, 2 right? 3 A I mean, they say that -- yeah, I mean, 4 they say that's something that they probably 5 won't -- would have liked to have had and address. 6 But they don't go as far as saying that they think 7 the results of their study could have been changed 8 because of endogenous NDMA exposure. 9 And, again, I think it's because there 10 is no reason to believe that the controls in the 11 cases vary very differently coming from the same 12 sort of population in terms of endogenous NDMA 13 exposure. 14 Q But, again, unless you actually 15 evaluate that, you don't know if there's a 16 differential effect of -- 17 A Yes -- for certain. Like, if you want 18 to be certain whether there is a change in the 19 effects, yes, you have to evaluate. But I am -- 20 again, I don't really know -- as far as I know, 21 there are no sort of gold standard measurement tools 22 to measure this in -- and incorporate it in an epi 23 study. 24 THE COURT REPORTER: In a what study? 25 THE WITNESS: In an epidemiological</p>

<p style="text-align: right;">Page 117</p> <p>1 study.</p> <p>2 MR. GALLAGHER: Can we mark as</p> <p>3 Exhibit 12 an article by Jakszyn,</p> <p>4 J-a-k-s-z-y-n, from 2006.</p> <p>5 And, Doctor, let me know when it shows</p> <p>6 up and you have it.</p> <p>7 THE WITNESS: Oh, sure. Sure.</p> <p>8 (Whereupon, Exhibit 12 was marked for</p> <p>9 Identification.)</p> <p>10 THE WITNESS: Okay. I got it.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q You got it? Okay.</p> <p>13 So the title of this article by</p> <p>14 Jakszyn is "Endogenous versus exogenous exposure to</p> <p>15 N-nitroso compounds and gastric cancer risk in the</p> <p>16 European Prospective Investigation into Cancer and</p> <p>17 Nutrition Study." Is that right?</p> <p>18 A Yes.</p> <p>19 Q So in this study, they did try to</p> <p>20 evaluate -- to measure and evaluate the potential</p> <p>21 impact of endogenous N-nitroso compounds, right?</p> <p>22 A Yeah, seems like it.</p> <p>23 Q Okay. And looking at the abstract, on</p> <p>24 the right-hand column -- of the top of the</p> <p>25 right-hand column of the first page, in this study,</p>	<p style="text-align: right;">Page 119</p> <p>1 Q If we turn to Table 1, which is on</p> <p>2 Page 1499.</p> <p>3 A Uh-huh.</p> <p>4 Q And this is providing a description of</p> <p>5 the sample included in the cohort. And do you see</p> <p>6 it's providing mean values for certain of the -- of</p> <p>7 the variables, including NDMA and endogenous</p> <p>8 N-nitroso compounds?</p> <p>9 A Yeah.</p> <p>10 Q The mean endogenous N-nitroso</p> <p>11 compounds in the -- in the study was 93.05</p> <p>12 micrograms per day, right?</p> <p>13 MR. NIGH: Object to form.</p> <p>14 THE WITNESS: How many --</p> <p>15 BY MR. GALLAGHER:</p> <p>16 Q And that would be 93,050 nanograms per</p> <p>17 day; is that right?</p> <p>18 A Micrograms per nanograms.</p> <p>19 THE COURT REPORTER: I'm sorry. Can</p> <p>20 you repeat that?</p> <p>21 THE WITNESS: I was just saying</p> <p>22 micrograms per nanograms.</p> <p>23 Can I just have a few minutes to read</p> <p>24 this, if you don't mind?</p> <p>25</p>
<p style="text-align: right;">Page 118</p> <p>1 they also were evaluating potential association of</p> <p>2 NDMA intake with risk of gastric cancer, right?</p> <p>3 A Yes.</p> <p>4 Q And you see about halfway down they</p> <p>5 say, "There was no association between NDMA intake</p> <p>6 and gastric cancer risk," right?</p> <p>7 A Sorry. Where are you referring to?</p> <p>8 Oh. Yes, that's what they say.</p> <p>9 Q Okay. And their observed hazard ratio</p> <p>10 for any potential association of NDMA intake and</p> <p>11 gastric cancer risk was exactly 1.00, right?</p> <p>12 A Right.</p> <p>13 Q And we had talked about a hazard ratio</p> <p>14 of 1 means there's no evidence of an association</p> <p>15 between the exposure and the risk, right?</p> <p>16 A Right.</p> <p>17 Q So in this study, when they were --</p> <p>18 they also evaluated endogenous N-nitroso compounds.</p> <p>19 That's abbreviated ENOC, right?</p> <p>20 A Yes.</p> <p>21 Q And there in the abstract they</p> <p>22 concluded -- or their data for endogenous N-nitroso</p> <p>23 compounds, the ENOC, was significantly associated</p> <p>24 with non-cardia cancer risk, right?</p> <p>25 A Yes.</p>	<p style="text-align: right;">Page 120</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q Sure, sure.</p> <p>3 MR. GALLAGHER: So, Daniel, in our</p> <p>4 depositions when the witness needed a long time</p> <p>5 to review a document, we went off the record.</p> <p>6 My question is pretty simple.</p> <p>7 MR. NIGH: We can go off the record.</p> <p>8 MR. GALLAGHER: Okay. Off the record.</p> <p>9 THE VIDEOGRAPHER: The time is now</p> <p>10 11:38. We're going off the record.</p> <p>11 (Whereupon, a short break was taken.)</p> <p>12 THE VIDEOGRAPHER: The time is now</p> <p>13 11:38. We're back on the record.</p> <p>14 MR. GALLAGHER: Thank you. And can</p> <p>15 the court reporter read back the last question.</p> <p>16 (Whereupon, the testimony was read</p> <p>17 back as requested.)</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q Dr. Etminan --</p> <p>20 A Yes. So with respect to the lack</p> <p>21 of -- risk with exogenous NDMA, I think I have</p> <p>22 addressed this in my report at the follow-up of the</p> <p>23 study. It was only about 3 and a half years, which</p> <p>24 is inadequate for an exogenous carcinogen causing</p> <p>25 cancer, and also, I do mention that just from the</p>



<p style="text-align: right;">Page 121</p> <p>1 demographics of the study, which are mainly --</p> <p>2 THE COURT REPORTER: Which are mainly</p> <p>3 what?</p> <p>4 THE WITNESS: Elderly, older adults.</p> <p>5 That they may have died before getting</p> <p>6 cancer, which usually has a longer sort of an</p> <p>7 onset. With respect to the 93,000 exogenous</p> <p>8 values, I -- the value seems quite high to me.</p> <p>9 And I don't -- I'm not familiar with the</p> <p>10 methodology that they used. And, again, I'm</p> <p>11 not saying that it's not the right methodology,</p> <p>12 but I just haven't seen any other study</p> <p>13 measuring endogenous NDMA as well.</p> <p>14 BY MR. GALLAGHER:</p> <p>15 Q Okay. In this study where they</p> <p>16 address endogenous and N-nitroso compounds, the mean</p> <p>17 endogenous N-nitroso compound in the -- in the study</p> <p>18 was 93,050 nanograms per day, right?</p> <p>19 A Yes.</p> <p>20 Q And if we go back to the abstract --</p> <p>21 A Yeah.</p> <p>22 Q -- the -- after presenting the hazard</p> <p>23 ratios for endogenous N-nitroso compounds, they go</p> <p>24 on to say, "Although the number of not infected</p> <p>25 cases is low, our data suggests a possible</p>	<p style="text-align: right;">Page 123</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q Yes, no association of exogenous NDMA</p> <p>3 intake and gastric cancer risk?</p> <p>4 A Right. But I think I did address</p> <p>5 that, although those are restraints of the study,</p> <p>6 the limitation -- I mean, not showing an association</p> <p>7 is also dependent on other factors. One, you need</p> <p>8 an adequate follow up to be able to detect the</p> <p>9 cancer. Two, you need to control for deaths other</p> <p>10 than cancer, which may sort of lower the -- your</p> <p>11 sample size. So you have to address for that, which</p> <p>12 they haven't.</p> <p>13 So I can't -- because they have other</p> <p>14 limitation -- methodological limitations, I can't</p> <p>15 just say, you know, there is no risk because they</p> <p>16 control for H. pylori and endogenous NDMA. There</p> <p>17 are other issues in the study design.</p> <p>18 Q So with respect to the -- the time for</p> <p>19 follow up, it was sufficiently long since they</p> <p>20 identified a significant association of endogenous</p> <p>21 N-nitroso compound with non-cardia cancers, right?</p> <p>22 MR. NIGH: Object to form.</p> <p>23 THE WITNESS: Right. But I mean, the</p> <p>24 mechanism of cancer with exogenous, I mean,</p> <p>25 could take longer. And so you need to -- you</p>
<p style="text-align: right;">Page 122</p> <p>1 interaction between ENOC and H. pylori infection,"</p> <p>2 right?</p> <p>3 A Yes.</p> <p>4 Q So they're seeing a possible</p> <p>5 interaction between an impact of endogenous</p> <p>6 N-nitroso compounds and infection with H. pylori?</p> <p>7 MR. NIGH: Form objection.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q Right?</p> <p>10 A Yeah, the interaction basically means</p> <p>11 that the levels of the -- the risk of cancer with</p> <p>12 endogenous NDMA changes with levels of H. pylori, so</p> <p>13 I mean, they have H. pylori measured. So that's</p> <p>14 what they found. That's -- I mean, I agree with</p> <p>15 that.</p> <p>16 Q Right. And so in this study where the</p> <p>17 authors accounted for endogenous N-nitroso compound</p> <p>18 and accounted for H. pylori infection, with respect</p> <p>19 to NDMA, the data showed no association between NDMA</p> <p>20 intake and gastric cancer, right?</p> <p>21 A You mean --</p> <p>22 THE COURT REPORTER: I'm sorry. You</p> <p>23 mean what?</p> <p>24 THE WITNESS: No association with</p> <p>25 exogenous NDMA?</p>	<p style="text-align: right;">Page 124</p> <p>1 may need a longer follow up for that to be</p> <p>2 picked up.</p> <p>3 THE COURT REPORTER: Could be what?</p> <p>4 THE WITNESS: You may need longer</p> <p>5 follow up for the exogenous for -- for cancers</p> <p>6 from exogenous NDMA to be picked up or to be</p> <p>7 detected.</p> <p>8 THE COURT REPORTER: Thank you.</p> <p>9 BY MR. GALLAGHER:</p> <p>10 Q Why do you -- why do think it would</p> <p>11 take longer for an exogenous?</p> <p>12 A Because you have to be taking it</p> <p>13 constantly, and it has to be ingested and then</p> <p>14 absorbed systemically. And it's possible that the</p> <p>15 mechanism of carcinogenesis with exogenous NDMA</p> <p>16 may -- may be different.</p> <p>17 Just like when you have a drug that's</p> <p>18 culled in your system, it's -- it's getting absorbed</p> <p>19 more than if you're taking a pill every day that's</p> <p>20 only 20 percent absorbed. So the -- the constant</p> <p>21 exposure and the concentrations may be different.</p> <p>22 MR. NIGH: Object to the form of the</p> <p>23 last question.</p> <p>24 BY MR. GALLAGHER:</p> <p>25 Q So you're telling me that the time</p>



<p style="text-align: right;">Page 125</p> <p>1 frame of exposure to an -- to an exogenous  2 carcinogen --  3 A I'm just saying that should -- it's  4 possible that the -- sorry. I should have let you  5 finish.  6 I'm just saying that the follow-up  7 time for the exogenous NDMA to show cancer events  8 where they could actually pick it up would have  9 been -- could have been higher -- you know, longer  10 than just the 3-year or 3-and-a-half-year follow up  11 that they had.  12 Q And am I understanding right that  13 you're saying the reason for that is because the  14 time frame of exposure to an exogenous carcinogen  15 is --  16 A Well, I mean, you don't --  17 THE COURT REPORTER: I'm sorry -- I'm  18 sorry, Doctor. I'm not hearing the -- I'm not  19 hearing the end of the questions, and  20 therefore, I'm not having the full question on  21 the record. If you could just take a deep  22 breath and let Patrick finish his question  23 before answering, I would appreciate it.  24 THE WITNESS: Okay.  25 MR. GALLAGHER: My apologies to the</p>	<p style="text-align: right;">Page 127</p> <p>1 want to look at Page 17 of your report, if you want  2 to look at it is where you're discussing this.  3 A Yes.  4 Q Okay. So you recall that it's one of  5 your criticisms of this -- of this article, right?  6 A Right.  7 Q If we look on Page 1498 of the  8 article, just under "Material and Methods for  9 Subjects," this cohort included women and men aged  10 35 to 70 years, right? So their age range is 35 to  11 70, right?  12 A Uh-huh.  13 Q And if we look at table 1, the mean  14 age at recruitment was 59.2, right?  15 A Right. So -- sorry. Can I address --  16 Q Yes.  17 A Yes. So 60 is a year where, you know,  18 they have cardiovascular disease. You could have  19 diabetes. It's the year where these conditions  20 these are prevalent. And deaths due to these  21 conditions, the risk for -- for deaths due to  22 diabetes and cardiovascular disease and other  23 co-morbid condition is -- is also increasing.  24 So if patients die for these causes  25 and not live -- live long enough to get cancer, that</p>
<p style="text-align: right;">Page 126</p> <p>1 court reporter and to Dr. Etminan.  2 BY MR. GALLAGHER:  3 Q So am I understanding properly, you're  4 saying that the reason for that is because the time  5 frame of exposure to an exogenous carcinogen is a  6 significant factor in the potential for actual risk  7 of cancer?  8 MR. NIGH: Object to the form.  9 THE WITNESS: Perhaps I would call it  10 induction time, which means the time from being  11 exposed from exogenous NDMA, which may take  12 longer to the cancer process to occur and be  13 diagnosed. Whereas, the endogenous, it's  14 already in the system. Whereas, the exogenous,  15 you need to be exposed to it, you know,  16 constantly through -- orally or through the  17 skin or through inhalation. So it may take  18 longer for the NDMA to cause its carcinogenic  19 effect for the cancer process.  20 BY MR. GALLAGHER:  21 Q Okay. You mentioned a few minutes ago  22 and also in your report one aspect of -- of this  23 study that you considered to be a material  24 limitation is that it included in mostly older  25 adults? Do I understand that right? And if you</p>	<p style="text-align: right;">Page 128</p> <p>1 is a bias that should be addressed, should have been  2 addressed in this study. That's what I was  3 referring to.  4 Q And then additionally, the -- so let  5 me ask you this: Those other co-morbid conditions  6 are factors from your perspective to be considered  7 because they can impact -- could have impacted the  8 results of this study?  9 A As you can see in Table 1, there's  10 no -- there's no information given on -- as they  11 have with the other variables, on the percentage  12 and -- and the breakdown of other co-morbid  13 conditions. I mean, if -- if the cases we're  14 sicker, get more ill, because of these kind of  15 conditions, could that have affected, you know dying  16 of -- of cancer, including the ones that were --  17 that died because of endogenous exposure. So I  18 think that those are potential confounders that  19 should have been adjusted for. And they were not.  20 They were only adjusted for things like smoking and  21 diet and physical activity, which are important, but  22 there are other potential confounders which I think  23 should have at least been mentioned as to why  24 they --  25 THE COURT REPORTER: As to why they</p>

<p style="text-align: right;">Page 129</p> <p>1 were what?</p> <p>2 THE WITNESS: They were not controlled</p> <p>3 for.</p> <p>4 BY MR. GALLAGHER:</p> <p>5 Q Do you know what the age of the cohort</p> <p>6 was for the --</p> <p>7 THE COURT REPORTER: For the what</p> <p>8 study?</p> <p>9 MR. GALLAGHER: Hidajat.</p> <p>10 THE WITNESS: I can look -- look it up</p> <p>11 right now. I don't know off the top of my</p> <p>12 head.</p> <p>13 BY MR. GALLAGHER:</p> <p>14 Q Okay. So if we go to Exhibit 8,</p> <p>15 Page 251.</p> <p>16 A Uh-huh.</p> <p>17 Q Under "Material and Methods," the data</p> <p>18 is from male UK rubber factory workers aged 35 years</p> <p>19 or older as of 1 February 1967, right?</p> <p>20 A Right.</p> <p>21 Q And it's not -- perhaps not that</p> <p>22 surprising that in a cohort study, looking at risks</p> <p>23 of cancer, the cohort is including older</p> <p>24 individuals, right?</p> <p>25 A Right. But -- but what Hidajat did</p>	<p style="text-align: right;">Page 131</p> <p>1 Q -- that was one of your criticisms of</p> <p>2 the Jakszyn study.</p> <p>3 A Uh-huh.</p> <p>4 Q So the Hidajat study didn't control</p> <p>5 for confounders like history of stomach cancer,</p> <p>6 right?</p> <p>7 A You're right. They did not. But</p> <p>8 again, just the sheer size of the -- the sample</p> <p>9 size, the very long follow up, that -- that</p> <p>10 confounding factor, which theoretically is a</p> <p>11 confounder has to be disproportionately, you know,</p> <p>12 higher in the high NDMA group than the low NDMA</p> <p>13 group. And given this is a population-based study</p> <p>14 where to some accounts the rates are, you know,</p> <p>15 probably stable over time, or go up, you know, a</p> <p>16 little bit just like most European countries in the</p> <p>17 UK, I don't see why absence of that confounder would</p> <p>18 have made any difference. Whereas here with</p> <p>19 Jakszyn, it's a much smaller study, only a</p> <p>20 3-and-a-half-year follow up. So I'm -- and I</p> <p>21 believe it's -- I'm just looking at the sample size.</p> <p>22 I believe it's a smaller sample size --</p> <p>23 THE COURT REPORTER: I'm sorry. Than</p> <p>24 what?</p> <p>25 THE WITNESS: Than Hidajat. No. It's</p>
<p style="text-align: right;">Page 130</p> <p>1 unlike -- none of the other studies that I have</p> <p>2 seen, is, if you look at Page 251 under "Statistical</p> <p>3 Methods," they did a special modeling technique</p> <p>4 called "Fine and Gray," which controls for death</p> <p>5 because it was such a long study with such a long</p> <p>6 follow up of say -- in 35 years. So people started</p> <p>7 at 35, but they would get to 50 and 60 and, you</p> <p>8 know -- in 10, 20 years, which is -- puts them at</p> <p>9 risk of other deaths, which as we've talked about,</p> <p>10 can bias the results if it's not -- if they're not</p> <p>11 accounted for. If they drop out of deaths other</p> <p>12 than cancer, then they don't get to get cancer. So</p> <p>13 they actually controlled for that with the</p> <p>14 Fine and Gray analysis.</p> <p>15 Q And as people get older, one of the --</p> <p>16 one of the risks for getting cancer is getting</p> <p>17 older, right?</p> <p>18 A Right.</p> <p>19 Q Okay. You also criticize the Jakszyn</p> <p>20 study for not controlling for confounders such as</p> <p>21 history of stomach cancer, right?</p> <p>22 A Yes.</p> <p>23 Q If you look on Page 17 of your</p> <p>24 report --</p> <p>25 A Right.</p>	<p style="text-align: right;">Page 132</p> <p>1 a bigger study. It's a bigger study. It's a</p> <p>2 bigger study. But I believe it's got smaller</p> <p>3 number of cases than Hidajat does, because</p> <p>4 Hidajat followed for a long time. So there are</p> <p>5 more cases.</p> <p>6 BY MR. GALLAGHER:</p> <p>7 Q Okay. So you agree with me that</p> <p>8 the -- the Jakszyn study, which evaluated exogenous</p> <p>9 NDMA intake as well as endogenous N-nitroso</p> <p>10 compounds is a larger study than the Hidajat study?</p> <p>11 A Number-wise, yes. Number-wise, it is.</p> <p>12 MR. NIGH: Object to form.</p> <p>13 BY MR. GALLAGHER:</p> <p>14 Q And you criticized the Jakszyn study</p> <p>15 for not controlling for confounders like history of</p> <p>16 stomach cancer, right?</p> <p>17 A Yes.</p> <p>18 Q And the -- the Hidajat study also</p> <p>19 didn't control for confounders like history of</p> <p>20 stomach cancer, right?</p> <p>21 A Yes.</p> <p>22 Q And so that same criticism applies --</p> <p>23 A It does.</p> <p>24 THE COURT REPORTER: I'm sorry. Can</p> <p>25 you repeat that?</p>

<p style="text-align: right;">Page 133</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q That same criticism of not controlling</p> <p>3 for confounders like a history of stomach cancer</p> <p>4 would be a criticism of any study that didn't</p> <p>5 account for that confounder?</p> <p>6 A That's right. But keep in mind that</p> <p>7 I -- I sort of came up with my opinion on stomach</p> <p>8 cancer, not just on Hidajat alone and Jakszyn alone.</p> <p>9 It was the totality of evidence. And there are --</p> <p>10 THE COURT REPORTER: I'm sorry. I'm</p> <p>11 sorry. What was that?</p> <p>12 THE WITNESS: Lavecchia, the study we</p> <p>13 just talked about before this one, did control</p> <p>14 for stomach cancer history.</p> <p>15 BY MR. GALLAGHER:</p> <p>16 Q Okay. What does that mean to you -- I</p> <p>17 understand you didn't base your opinions solely on</p> <p>18 the Hidajat and the Jakszyn study. What does that</p> <p>19 mean to you, though, to be looking at the "totality</p> <p>20 of the evidence"?</p> <p>21 A Totality of the evidence means</p> <p>22 biologically plausible evidence, which is mostly</p> <p>23 from animal studies; data from, mainly, Hidajat;</p> <p>24 from occupational studies; and data from dietary</p> <p>25 studies. And, again, it doesn't mean that every</p>	<p style="text-align: right;">Page 135</p> <p>1 and the risk of gastric cancer, right?</p> <p>2 A It found an odd ratio of two that just</p> <p>3 missed statistical significance.</p> <p>4 Q But it did miss statistical</p> <p>5 significance, right?</p> <p>6 A Yes.</p> <p>7 Q This study also reported a</p> <p>8 statistically significant increased risk for gastric</p> <p>9 cancer based on family history, right?</p> <p>10 A Yes.</p> <p>11 Q And family history for gastric cancer</p> <p>12 would be a known risk factor, right?</p> <p>13 A It would be.</p> <p>14 Is there a table that I should refer</p> <p>15 to or any numbers here?</p> <p>16 Q Sure. You can look at -- we can look</p> <p>17 on Page 165.</p> <p>18 A Sorry. Palli is Pages 1206 to --</p> <p>19 Q Oh, sorry. It's the third page of the</p> <p>20 PDF, Page 165. There's Table 1.</p> <p>21 A Okay.</p> <p>22 Q Showing the family history and then in</p> <p>23 the left-hand column under "Results"?</p> <p>24 A Uh-huh.</p> <p>25 MR. NIGH: Are you following along on</p>
<p style="text-align: right;">Page 134</p> <p>1 single study is a perfect study that shows an</p> <p>2 increase in risk, and they don't have limitations.</p> <p>3 But the constellation of all of the evidence is what</p> <p>4 I weighted my opinion on.</p> <p>5 Q Okay.</p> <p>6 MR. GALLAGHER: Can we mark as the</p> <p>7 next exhibit, Exhibit 13, the Palli study.</p> <p>8 (Whereupon, Exhibit 13 was marked for</p> <p>9 Identification.)</p> <p>10 THE COURT REPORTER: Can you spell</p> <p>11 that?</p> <p>12 MR. GALLAGHER: P-a-l-l-i.</p> <p>13 THE COURT REPORTER: Thank you.</p> <p>14 BY MR. GALLAGHER:</p> <p>15 Q And, Dr. Etminan, you discuss this</p> <p>16 study at the top of Page 17 of your report.</p> <p>17 A Okay.</p> <p>18 Q Dr. Etminan, in this study, there</p> <p>19 was --</p> <p>20 A Sorry. Sorry. Just give me one</p> <p>21 second to read this paper.</p> <p>22 Q Sure.</p> <p>23 A Okay. Go ahead.</p> <p>24 Q This study did not find a</p> <p>25 statistically significant association between NDMA</p>	<p style="text-align: right;">Page 136</p> <p>1 Page 165 because I don't see a 165?</p> <p>2 THE WITNESS: It's Page 1208.</p> <p>3 MR. GALLAGHER: I think we need a</p> <p>4 different --</p> <p>5 MS. APPEL: Yeah, I'm sorry --</p> <p>6 MR. GALLAGHER: No worries.</p> <p>7 MS. APPEL: (inaudible)</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q So we'll get there. But, Dr. Etminan,</p> <p>10 let's talk just -- let's talk about family history</p> <p>11 of gastric cancer.</p> <p>12 Do you acknowledge that that is a</p> <p>13 known risk factor for a person to develop gastric</p> <p>14 cancer if they have a family history of gastric</p> <p>15 cancer, right?</p> <p>16 A Yes.</p> <p>17 Q And the -- the Hidajat study and the</p> <p>18 Lavecchia study, they didn't account for that?</p> <p>19 A Yes.</p> <p>20 Q -- as a factor -- as a factor, right?</p> <p>21 A No.</p> <p>22 MR. GALLAGHER: So Exhibit 14 should</p> <p>23 be coming. It's a Palli study.</p> <p>24 (Whereupon, Exhibit 14 was marked for</p> <p>25 Identification.)</p>

<p style="text-align: right;">Page 137</p> <p>1 THE WITNESS: Okay.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Dr. Etminan, have you seen this</p> <p>4 article before?</p> <p>5 A It's by Palli, so I may have seen it,</p> <p>6 but included the one that I -- included within my</p> <p>7 report, because it's pretty much from the same</p> <p>8 authors.</p> <p>9 Q So can you explain that to me again?</p> <p>10 Have you seen this before or not?</p> <p>11 A I may have, but I haven't included it</p> <p>12 in my report. I may have seen it in my search.</p> <p>13 Q Okay. So you're not relying on</p> <p>14 this -- can you turn to your report, which is</p> <p>15 Exhibit 5, I think?</p> <p>16 A Sorry.</p> <p>17 Q Turn to your report, Exhibit 5, and on</p> <p>18 Page 17...</p> <p>19 A Yes.</p> <p>20 Q And you see at the top of Page 17, you</p> <p>21 refer to a population-based case controlled study</p> <p>22 conducted by Palli, right --</p> <p>23 A Yes.</p> <p>24 Q -- in Citation 43?</p> <p>25 A Yes.</p>	<p style="text-align: right;">Page 139</p> <p>1 at Exhibit 14, on Page 165, the third page of the</p> <p>2 PDF, Table 1, it's presenting the data with respect</p> <p>3 to family history.</p> <p>4 A Yes.</p> <p>5 Q And in the description of the results,</p> <p>6 which is starting on the left-hand column of this</p> <p>7 same page, the authors state, "A positive family</p> <p>8 history for gastric cancer among parents or</p> <p>9 siblings, rural residence and lower social class</p> <p>10 were strongly associated with increased risk"?</p> <p>11 A Yes.</p> <p>12 Q So all of those -- the Palli study was</p> <p>13 able to determine that all of those factors were</p> <p>14 strongly associated with risk of gastric cancer,</p> <p>15 right?</p> <p>16 A Those are risk factors, yes.</p> <p>17 Q Okay. But there was no -- no</p> <p>18 statistically significant association between</p> <p>19 exogenous NDMA intake and gastric cancer from this</p> <p>20 study, right?</p> <p>21 A No.</p> <p>22 MR. GALLAGHER: Can we mark as</p> <p>23 Exhibit 15 the Loh paper, L-o-h.</p> <p>24 (Whereupon, Exhibit 15 was marked for</p> <p>25 Identification.)</p>
<p style="text-align: right;">Page 138</p> <p>1 Q Can we go to Page 38 of your report?</p> <p>2 A Yes.</p> <p>3 Q And so the citation for 43 is to</p> <p>4 Palli, an article titled "Dietary Patterns, Nutrient</p> <p>5 Intake and Gastric Cancer in a High-Risk Area of</p> <p>6 Italy," right?</p> <p>7 A Right.</p> <p>8 Q And that citation is to the article</p> <p>9 that we were just looking at that's Exhibit 14,</p> <p>10 right?</p> <p>11 A Right.</p> <p>12 Q But you said you didn't rely on this</p> <p>13 for your report?</p> <p>14 A Right. I thought there were two Palli</p> <p>15 studies that you showed me. The one Palli study</p> <p>16 that I cite in my report, I believe, is this one.</p> <p>17 Yes. It's this one because it's 382 gastric cancer</p> <p>18 cases, and that's what I have. So it's this one.</p> <p>19 Q Okay.</p> <p>20 A By Palli, Russo and Decarli.</p> <p>21 Q I think we're confused because the</p> <p>22 article that you -- the Palli article you produced</p> <p>23 to us was the other one.</p> <p>24 A Okay. Sorry.</p> <p>25 Q Okay. Okay. So if we -- if we look</p>	<p style="text-align: right;">Page 140</p> <p>1 MR. GALLAGHER: Actually, I'll come</p> <p>2 back to that one. Can we mark the Kefzei paper</p> <p>3 and this will be Exhibit 16. K-e-f-z-e-i.</p> <p>4 THE COURT REPORTER: K-e-f-z-e-i?</p> <p>5 MR. GALLAGHER: Correct.</p> <p>6 (Whereupon, Exhibit 16 was marked for</p> <p>7 Identification.)</p> <p>8 THE WITNESS: I have it open.</p> <p>9 BY MR. GALLAGHER:</p> <p>10 Q Okay. And this is a paper that you</p> <p>11 refer to also on Page 17 of your report, right?</p> <p>12 A Yes.</p> <p>13 Q So the -- if we pull up Page 17 of</p> <p>14 your report that would be helpful.</p> <p>15 A Yeah.</p> <p>16 Q The paragraph on Kefzei, "The</p> <p>17 adjusted --" "The adjusted risk of gastric</p> <p>18 cancer" --</p> <p>19 A I'm sorry. So -- I'm sorry. You're</p> <p>20 not on Loh then? You want to look at Kefzei?</p> <p>21 Q Sorry. Yes.</p> <p>22 A Okay. Let me get that. Let me get</p> <p>23 that. Okay.</p> <p>24 Q So you say that, "The adjusted risk of</p> <p>25 gastric cancers with nitrosamine intake among men</p>

<p style="text-align: right;">Page 141</p> <p>1 was elevated by 6 percent, and you're basing that  2 off of a hazard ratio of 1.06," right?  3 MR. NIGH: Objection.  4 BY MR. GALLAGHER:  5 Q And that's for one type of gastric  6 cancer, right?  7 A Yes.  8 Q And then you acknowledge that this is  9 not for other types of gastric cancer, gastric  10 cardia, although the observed hazard ratio is 1.31,  11 that did not --  12 THE COURT REPORTER: I'm sorry.  13 That's not very specific...  14 THE WITNESS: It did not reach  15 statistical significance.  16 BY MR. GALLAGHER:  17 Q Did not reach statistical  18 significance.  19 A Yeah.  20 Q You see that, right?  21 A Yes.  22 Q And then among women, the risk was  23 also not elevated, right?  24 A Correct.  25 Q And you go on to say, "The lack of an</p>	<p style="text-align: right;">Page 143</p> <p>1 of -- of food intake, right?  2 A That's the one limitation of all  3 dietary studies, right.  4 Q Okay. So -- let's move on then.  5 MR. GALLAGHER: Can we mark the Song  6 study as -- are we at -- what exhibit number  7 are we at?  8 (Whereupon, Exhibit 17 was marked for  9 Identification.)  10 MR. GALLAGHER: So this will be  11 Exhibit 17, the Song article.  12 BY MR. GALLAGHER:  13 Q Let me know when you have it,  14 Dr. Etminan.  15 A I have it now.  16 Q Okay. So you agree with me that this  17 is -- this article is reporting on a meta-analysis?  18 A That's correct.  19 Q Okay. Have you conducted a  20 meta-analysis before?  21 A Yes.  22 Q Okay. And this is a meta-analysis of  23 observational studies, right?  24 A Yes.  25 Q Is one of the limitations of a</p>
<p style="text-align: right;">Page 142</p> <p>1 effect in this study," so you acknowledge that in  2 this study, there's a lack of any association of  3 exogenous NDMA with gastric cancer, right?  4 MR. NIGH: Object to form.  5 THE WITNESS: That's -- yes.  6 BY MR. GALLAGHER:  7 Q Okay. And you go on to try and -- one  8 issue that you raised is a potential for  9 misclassification of the diet questionnaire used in  10 the study?  11 A Yes.  12 Q Right? That potential for  13 misclassification that you're referring to is  14 potential inaccurate reporting of -- of food intake  15 by the subjects in the study, right?  16 A Correct.  17 Q Okay. Isn't that true of every  18 dietary study that's based on a diet questionnaire?  19 A Yes, it could -- it could occur in any  20 dietary study.  21 Q So the -- I guess what I want -- so  22 regardless of whether the observed association is  23 showing no association or showing some association,  24 there is -- this is a criticism of dietary studies  25 generally, the potential for inaccurate reporting</p>	<p style="text-align: right;">Page 144</p> <p>1 meta-analysis observational studies the potential  2 for confounding variable?  3 A I mean -- yeah. I mean, that's a  4 limitation of observational studies as well, yes.  5 Q So for any meta-analysis of  6 observational studies, you would agree that residual  7 confounding factors may distort the results?  8 A I mean, there is a potential,  9 theoretically, yes.  10 Q So have you actually seen this article  11 or just the abstract for it?  12 A No. I have seen -- I have -- I mean,  13 I have looked at the numbers and the tables as well.  14 Q Okay. So if we look on -- do we have  15 Page 9892?  16 A Okay.  17 Q So I guess, I think I asked this  18 question somewhat generally although it applies to  19 the -- certainly to the Song meta-analysis.  20 You would agree with me that  21 measurement errors resulting from dietary  22 questionnaires can impact the reliability of dietary  23 studies, right?  24 MR. NIGH: Form objection.  25 THE WITNESS: Generally speaking, I</p>



<p style="text-align: right;">Page 145</p> <p>1 think we've -- we've talked about this, yes.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Okay. And dietary questionnaires -- a</p> <p>4 questionnaire doesn't ask subjects, how much NDMA</p> <p>5 did you eat -- the dietary, right?</p> <p>6 A Yes. They ask about the dietary</p> <p>7 patterns of individuals, and then they convert the</p> <p>8 food groups to -- they convert the NDMA content in</p> <p>9 each food group based on the information they have</p> <p>10 on the amount of NDMA in each food category.</p> <p>11 Q Okay. So it may ask, how much bacon</p> <p>12 do you eat, how much fish, how much fruit?</p> <p>13 A That's right.</p> <p>14 Q And then -- and then from there, the</p> <p>15 authors or the people conducting the study estimate</p> <p>16 NDMA intake for the subjects based on estimates for</p> <p>17 the amount of NDMA or any other compound in that</p> <p>18 particular food group, right?</p> <p>19 A That's right.</p> <p>20 Q And if those -- if those estimates are</p> <p>21 wrong, that also impacts the validity of the results</p> <p>22 from a dietary study?</p> <p>23 A Also, I mean, potentially. We have</p> <p>24 talked about this. It's a limitation of dietary</p> <p>25 study.</p>	<p style="text-align: right;">Page 147</p> <p>1 A The confidence interval. It was from</p> <p>2 .5 to 4.7, around the 1.5 estimate.</p> <p>3 Q Right. And so because the confidence</p> <p>4 interval includes 1.0, there's -- there's no</p> <p>5 evidence of an association, right?</p> <p>6 A No, I -- again, I think I talked about</p> <p>7 this earlier. It's -- the relative risk is 1.5</p> <p>8 based on very small number of events. And that 1.5</p> <p>9 comes with a very imprecise estimate. We cannot</p> <p>10 necessarily say that there is no increased risk. We</p> <p>11 can say that it's imprecise, and the results are</p> <p>12 basically -- I'm trying to find the right word.</p> <p>13 Uncertain, if you will.</p> <p>14 Q Okay.</p> <p>15 MR. GALLAGHER: Can we mark the Knekt</p> <p>16 paper? This will be Exhibit 18, I believe.</p> <p>17 (Whereupon, Exhibit 18 was marked for</p> <p>18 Identification.)</p> <p>19 THE COURT REPORTER: How do you spell</p> <p>20 that.</p> <p>21 MR. GALLAGHER: K-n-e-k-t.</p> <p>22 BY MR. GALLAGHER:</p> <p>23 Q Let me know when it shows up.</p> <p>24 A Okay.</p> <p>25 Q So, Dr. Etminan, you rely on this</p>
<p style="text-align: right;">Page 146</p> <p>1 Q Okay. Let's go back to your report.</p> <p>2 We'll look at Page 18 and Section 10.2 at the bottom</p> <p>3 of the page.</p> <p>4 A Okay.</p> <p>5 Q It's is referring to colorectal</p> <p>6 cancer.</p> <p>7 A Okay.</p> <p>8 Q So for colorectal cancer, Hidajat</p> <p>9 didn't look at colorectal cancer right?</p> <p>10 A No.</p> <p>11 Q Didn't examine -- okay.</p> <p>12 And the Straif occupational study did</p> <p>13 not find any specifically significant association,</p> <p>14 right?</p> <p>15 A No.</p> <p>16 Q Okay.</p> <p>17 A Because I think it was just they</p> <p>18 didn't have enough cases because they -- I don't</p> <p>19 think they had enough number of events. But the</p> <p>20 answer to your question, is no.</p> <p>21 They found a relative risk of</p> <p>22 one-and-a half, but because of the small number of</p> <p>23 events, it was very imprecise and not statistically</p> <p>24 significant.</p> <p>25 Q What was imprecise?</p>	<p style="text-align: right;">Page 148</p> <p>1 study with respect to your opinion -- your opinions</p> <p>2 with respect to colorectal cancer?</p> <p>3 A Right.</p> <p>4 Q But you criticize the study with</p> <p>5 respect to your opinion for gastric cancer. Do you</p> <p>6 recall that?</p> <p>7 MR. NIGH: Object to form.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q And feel free to refer to Pages 17 and</p> <p>10 19 of -- of your report, which is Exhibit 5.</p> <p>11 A Yes, just give me a second.</p> <p>12 So my criticism was, again, for, I</p> <p>13 believe, competing events -- lack of control for</p> <p>14 competing events. Patients end up dying before</p> <p>15 getting stomach cancer. You could argue it's -- you</p> <p>16 know, it could be --</p> <p>17 THE COURT REPORTER: I'm sorry. I'm</p> <p>18 sorry. Can you speak up and repeat that,</p> <p>19 please?</p> <p>20 THE WITNESS: So my criticism was a</p> <p>21 lack of controlling for competing events for --</p> <p>22 for death due to other causes. If patients</p> <p>23 died earlier, they -- you know, some patients</p> <p>24 could have died early and not get stomach</p> <p>25 cancer. One could argue it's the same -- it</p>

<p style="text-align: right;">Page 149</p> <p>1 could be the same for colorectal cancer</p> <p>2 patients. But it's also possible that those</p> <p>3 patients were followed up over longer periods.</p> <p>4 We don't know.</p> <p>5 But my other criticism is the smaller</p> <p>6 number of cases in the -- for stomach cancer is</p> <p>7 68 in the -- for the stomach cancer cases, and</p> <p>8 for colorectal cancer, it's 73. 68 versus --</p> <p>9 I'm reading that off of Table 1 -- 73. So</p> <p>10 those -- those five extra cases could -- you</p> <p>11 know, could change the results. So that's what</p> <p>12 I based my opinion on.</p> <p>13 Because -- I'm sorry. If I could just</p> <p>14 add because the -- the upper bound --</p> <p>15 THE COURT REPORTER: I'm sorry.</p> <p>16 Doctor, I'm sorry. You're speaking with your</p> <p>17 hand over your mouth, and I'm not understanding</p> <p>18 you.</p> <p>19 THE WITNESS: Okay. The upper bound</p> <p>20 confidence interval for stomach cancer is 1.51,</p> <p>21 so it's very wide, suggestive of a small number</p> <p>22 of cases. Whereas for colorectal cancer, it's</p> <p>23 higher. And it's significant, so the</p> <p>24 difference of these five cases could</p> <p>25 potentially -- I mean, it is possible that</p>	<p style="text-align: right;">Page 151</p> <p>1 Q -- on the phone are you?</p> <p>2 A No. My phone was right behind my</p> <p>3 laptop.</p> <p>4 Q Okay. Yes, please keep that set to</p> <p>5 the side.</p> <p>6 So in your report on page Exhibit 17,</p> <p>7 you criticize the Knekt study possibly having</p> <p>8 imprecision of dietary questionnaires for</p> <p>9 quantifying NDMA from different food groups, right?</p> <p>10 A Right.</p> <p>11 Q And then carrying over onto Page 18,</p> <p>12 "This imprecision might have led to</p> <p>13 misclassification of the true NDMA effects with</p> <p>14 respect to cancer and might have led to null</p> <p>15 results."</p> <p>16 Do you see that?</p> <p>17 A Yes.</p> <p>18 Q When you're saying that, that</p> <p>19 imprecision of the dietary questionnaires, would</p> <p>20 apply equally to the data with respect to colorectal</p> <p>21 cancer, right?</p> <p>22 MR. NIGH: Object to form.</p> <p>23 THE WITNESS: Not if they're not the</p> <p>24 same people answering the question. I mean,</p> <p>25 if -- if they -- if the stomach cancer cases,</p>
<p style="text-align: right;">Page 150</p> <p>1 these extra five cases made a difference, but</p> <p>2 we don't know.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q Well, for gastric cancer, the lower</p> <p>5 bound is 0.37, right?</p> <p>6 A Yes, it's .037. I'm not arguing about</p> <p>7 the magnitude. It's -- it goes from very low to</p> <p>8 relatively high. I'm just saying that this very</p> <p>9 wide bound is suggestive of a small number of</p> <p>10 events. And so this study may not have had enough</p> <p>11 events to show a more precise estimate for stomach</p> <p>12 cancer.</p> <p>13 Q Well, the lower bounds -- let's talk</p> <p>14 for a minute about what it would mean for the hazard</p> <p>15 ratio to be 0.37. What would that mean to you?</p> <p>16 A The 3.7 hazard ratio is -- it means</p> <p>17 that it's -- it's a protective event.</p> <p>18 Q So if the -- okay. It would be</p> <p>19 protective.</p> <p>20 In your report -- Dr. Etminan, do you</p> <p>21 have a phone with you or anything else?</p> <p>22 A Yes.</p> <p>23 Q I guess I would ask that you -- okay.</p> <p>24 You're not receiving communications from anybody --</p> <p>25 A No. No. No.</p>	<p style="text-align: right;">Page 152</p> <p>1 let's say -- and we don't know this, but I'm</p> <p>2 just answering your question. If the stomach</p> <p>3 cancer cases give more imprecise answering than</p> <p>4 the colorectal cancer cases, then they would</p> <p>5 have more imprecise estimate in the results</p> <p>6 because they're not the same patients.</p> <p>7 BY MR. GALLAGHER:</p> <p>8 Q Okay. Would you expect there to be a</p> <p>9 difference in the imprecision of -- well, I guess a</p> <p>10 couple of questions.</p> <p>11 One, when you're talking about that,</p> <p>12 you're talking about imprecision of the actual</p> <p>13 answers to the dietary questionnaire, what foods --</p> <p>14 A Right. So you have imprecision on</p> <p>15 what's a measurement error from the -- the study</p> <p>16 population, and then you -- I mean, you may have --</p> <p>17 in all studies of this nature, you could have an</p> <p>18 imprecision in recording the data.</p> <p>19 I'm just saying because they're --</p> <p>20 they're not the same patients. You can't assume</p> <p>21 that the same thing would happen to cancer -- happen</p> <p>22 to colorectal cancer than happen to stomach cancer</p> <p>23 cases or vice versa.</p> <p>24 Q Okay. Would you expect there to be a</p> <p>25 difference in the manner in which the foods -- the</p>

<p style="text-align: right;">Page 153</p> <p>1 dietary questionnaires answered by individuals who  2 end up with stomach cancer versus individuals who  3 end up with colorectal cancer?  4 A Generally speaking, no. But again --  5 let me just check one thing.  6 Q Dr. Etminan --  7 A Generally speaking, no.  8 Q Okay. And then there's an additional  9 possibility for error -- additional possibility for  10 imprecision in quantifying the NDMA. And that's if  11 the estimate that the authors used for the amount of  12 NDMA in any specific food group, if that's  13 incorrect, then that's going to lead to  14 imprecision -- imprecision also. And that  15 imprecision would apply equally with respect to  16 stomach cancer and colorectal cancer, right?  17 A Yes.  18 Q Okay. When you make the statement  19 here that the imprecision might have led to  20 misclassification of the true NDMA effect with  21 respect to cancer, you're assuming that there's an  22 effect of NDMA on the cancer, right?  23 MR. NIGH: Object to form.  24 THE WITNESS: I'm assuming -- again,  25 because of the smaller number of cases and the</p>	<p style="text-align: right;">Page 155</p> <p>1 THE WITNESS: I don't recall. I don't  2 recall.  3 BY MR. GALLAGHER:  4 Q Okay. If you want to look at your  5 report on Page 17 and on Page 19?  6 A Okay.  7 Q So -- and maybe if we pull up Page 17,  8 the second paragraph.  9 A Yes.  10 Q Okay. So you refer to imprecise  11 estimates of the risk. Why do you consider them to  12 be imprecise?  13 A Of the 1.13? Because -- because your  14 upper bound when the -- when the upper bound is  15 clinically can -- shows a clinically significant  16 risk and you have an end point interval which goes  17 from .81 and the relative risk is 1.13. So it's,  18 you know, it's not large, but it's a 13 percent  19 increase. That means, it's -- it's an imprecise  20 estimate. And then if you look at Loh's number of  21 gastric cancers, that also kind of brings the  22 message home, because they only had, I believe,  23 55 -- I'm just trying to look at it -- what was Loh  24 number again, sorry, the exhibit number?  25 Q 15, Exhibit 15.</p>
<p style="text-align: right;">Page 154</p> <p>1 upper bound confidence interval, the number in  2 the results we see is -- basically, we don't  3 know. And so it is possible.  4 BY MR. GALLAGHER:  5 Q But what the data is -- okay.  6 THE VIDEOGRAPHER: Counsel, there's  7 about 10 minutes left on this video unit.  8 MR. GALLAGHER: Okay. I will finish  9 this up, and then we can take a break for  10 lunch.  11 Can we mark the -- we already marked  12 the Loh study.  13 THE WITNESS: What's the exhibit  14 number on Loh?  15 MR. GALLAGHER: Exhibit 15.  16 THE WITNESS: Okay.  17 BY MR. GALLAGHER:  18 Q And I think this is similar to the  19 Knekt paper that we were just talking about, you --  20 you criticize the Loh study with respect to gastric  21 cancer. But then you rely on it for your opinions  22 with respect to colorectal cancer. Do you recall  23 that?  24 MR. NIGH: Object to form,  25 mischaracterizes evidence.</p>	<p style="text-align: right;">Page 156</p> <p>1 A They only had 64 cases where, you  2 know, in other cancers -- like others in the "other  3 cancer" category, you have 1,462 cases. For  4 stomach, you only have 64. So that's why I said  5 it's imprecise.  6 Q So would you -- you're referring to  7 the upper bound and the lower bound?  8 A Yeah.  9 Q And you said where the upper bound is  10 showing a potential association that that's what  11 you're considering to be imprecise --  12 A I would say -- I wouldn't say  13 association. It shows a risk of 1.57, which is  14 clinically significant. If it was 1.2, then one  15 would say well, even the upper bound of 1.2 is not  16 that big of a deal. But 1.57 makes it significant.  17 Q How are you -- how are you deciding  18 that 1.2 might not be clinically significant but  19 1.57 might be clinically significant?  20 A I mean, usually anything below 1.5, we  21 think that -- and closer to 1 is significant of no  22 risk. And the higher, from 1.5 to even higher, is  23 suggestive of -- if it's the upper bound and it's  24 imprecise, I would say, if it's above an increase in  25 risk that's imprecise, that needs to be looked into,</p>

<p style="text-align: right;">Page 157</p> <p>1 or inconclusive basically.</p> <p>2 Q Okay. You would agree with me that if</p> <p>3 there is no association between an exposure and a</p> <p>4 risk, you would expect the observed relative risk to</p> <p>5 be close to 1, right?</p> <p>6 MR. NIGH: Object to form.</p> <p>7 THE WITNESS: I don't -- I don't want</p> <p>8 a say yes. That's a very, very general</p> <p>9 statement. There are large -- very large</p> <p>10 studies done with relative risks of 1.15 or</p> <p>11 1.16 that is -- where the results have been</p> <p>12 taken seriously. So I don't want to say yes as</p> <p>13 a general statement.</p> <p>14 THE VIDEOGRAPHER: Counsel, there's</p> <p>15 about 3 minutes remaining.</p> <p>16 MR. GALLAGHER: Okay. Let me finish</p> <p>17 this up, and I'll take a break.</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q I guess my question was slightly</p> <p>20 different. If there is no association between an</p> <p>21 exposure and a risk, start from that assumption, you</p> <p>22 would expect the observed -- the observed relative</p> <p>23 risk to be close to 1, right?</p> <p>24 MR. NIGH: Object to form.</p> <p>25 THE WITNESS: If you knew -- if you</p>	<p style="text-align: right;">Page 159</p> <p>1 think you mentioned, you could have a low relative</p> <p>2 risk that has a huge confidence interval. Actually,</p> <p>3 that -- that is more inconclusive than negative. If</p> <p>4 it's a relative risk close to 1 with a very tight</p> <p>5 confidence interval also close to 1 or below 1.5 for</p> <p>6 the upper limits, that is -- yes, that -- I'm more</p> <p>7 confident in that case that there is no risk.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q Where are you coming up with this --</p> <p>10 this limit of 1.5?</p> <p>11 A 1.5 or higher, not just 1.5. 1.5 or</p> <p>12 higher.</p> <p>13 Because it's -- it's technically a</p> <p>14 15 percent increase that -- that is included in that</p> <p>15 interval. And one should, you know, do a further</p> <p>16 investigation to further look at that. I don't</p> <p>17 think it's -- it's high enough to warrant further</p> <p>18 investigation with a bigger study, you know, higher</p> <p>19 number of cases. It is not a definitive negative</p> <p>20 with those numbers.</p> <p>21 MR. GALLAGHER: We can go off the</p> <p>22 record now.</p> <p>23 THE VIDEOGRAPHER: The time is now</p> <p>24 12:49. This ends Media Unit Number 3. We're</p> <p>25 going off the record.</p>
<p style="text-align: right;">Page 158</p> <p>1 knew there isn't an association?</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q You know there is not an association</p> <p>4 between the exposure and the risk --</p> <p>5 A Right. Right. I want -- right. So</p> <p>6 the relative risk has to be close to 1 and the</p> <p>7 upper -- the -- the confidence intervals also have</p> <p>8 to be precise enough to exclude a risk, right?</p> <p>9 So -- so if you tell me there is a</p> <p>10 relative risk of 1.2 with a confidence interval of</p> <p>11 1.9 to 1.3, that -- that would tell me that, yes,</p> <p>12 there's probably no risk associated. But with an</p> <p>13 upper bound of 1.57, I would like -- you know, I'm</p> <p>14 more comfortable saying this is an inconclusive</p> <p>15 study rather than a no risk or a negative study.</p> <p>16 Q But you agree that the data, the</p> <p>17 confidence interval is -- is going to or can include</p> <p>18 both below 1 and above 1 if there's no association?</p> <p>19 In fact, you might expect that?</p> <p>20 MR. NIGH: Object to form.</p> <p>21 BY MR. GALLAGHER:</p> <p>22 Q Correct?</p> <p>23 A Well, precision, if I wanted -- if I</p> <p>24 want to decide on risk or no risk, precision is also</p> <p>25 important because you could have -- again, as I</p>	<p style="text-align: right;">Page 160</p> <p>1 (Whereupon, a lunch recess was taken.)</p> <p>2 THE VIDEOGRAPHER: The time is now</p> <p>3 1:30. This begins Media Unit Number 4. We're</p> <p>4 back on the record.</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q Welcome back, Dr. Etminan.</p> <p>7 A Thank you.</p> <p>8 Q Did you have a good lunch?</p> <p>9 A Not bad.</p> <p>10 Q Excellent. In part of your report,</p> <p>11 Dr. Etminan, you go through a Bradford Hill</p> <p>12 analysis?</p> <p>13 A Yes.</p> <p>14 Q Is a Bradford Hill analysis something</p> <p>15 that you do in your professional capacity outside of</p> <p>16 serving as an expert for litigation?</p> <p>17 A I mean, I use the criteria set by</p> <p>18 Bradford Hill to when I'm looking for -- or asking</p> <p>19 questions as part of my research on whether Drug A</p> <p>20 causes, you know, outcome Y, because I feel like it</p> <p>21 is relatively complete, and it has a lot of the sort</p> <p>22 of variables that one needs to consider when</p> <p>23 deciding on a cause --</p> <p>24 THE COURT REPORTER: On a cause of</p> <p>25 what?</p>

<p style="text-align: right;">Page 161</p> <p>1 THE WITNESS: Causal question.  2 THE COURT REPORTER: Thank you.  3 BY MR. GALLAGHER:  4 Q Have you published papers that present  5 the Bradford Hill analysis?  6 A I can't remember off the top of my  7 head, but most of my papers are original research,  8 which means I am -- I am not really asking a causal  9 question based on the available evidence. I'm  10 asking a causal question, say, on the drug that's  11 never been asked before. So, you know, the  12 Bradford Hill doesn't necessarily apply to those  13 types of questions. But I have used it as part of  14 my research when I'm reviewing a topic.  15 Q So when you say most of your  16 research -- I will ask you a new question. Strike  17 that.  18 When you say most of your research is  19 the type of research that Bradford Hill wouldn't  20 apply to, why is that?  21 A Because Bradford Hill, again, is a  22 method used to establish causality on questions  23 where there is evidence already. And so one uses  24 this criteria with that evidence to see whether  25 there's a causal link between that drug and that</p>	<p style="text-align: right;">Page 163</p> <p>1 Environment and Disease Association or Causation,"  2 right?  3 A Right.  4 Q And this is -- the article  5 originally -- this is a republication of an article  6 first published in 1965 where Sir Bradford Hill lays  7 out the factors that he feels are appropriate to  8 evaluate in assessing the causation question, right?  9 MR. NIGH: Object to form.  10 THE WITNESS: Yes.  11 BY MR. GALLAGHER:  12 Q You agree with me that association is  13 different from causation, right?  14 A Generally speaking, all the causations  15 are associations, but not all associations are  16 causations.  17 Q All right. Can you say that again?  18 A All causations are associations, but  19 the reverse is not true; so not all associations are  20 causations.  21 Q Okay. I just wanted to make sure that  22 I understood you properly.  23 So those are -- there can be  24 associations that are observed where there's not a  25 causal connection between the exposure and the</p>
<p style="text-align: right;">Page 162</p> <p>1 outcome.  2 If I'm doing an original study where  3 no one has looked at the question, you know, before,  4 or there isn't a lot of evidence and I am the  5 actual -- the only person or the very few people who  6 are actually trying to answer the question, then the  7 Bradford Hill doesn't really apply to these types of  8 original research studies.  9 MR. GALLAGHER: I'd like to mark as  10 the next exhibit, Exhibit 19, an article by  11 Bradford Hill that you cited in your report.  12 Let me know when it shows up.  13 (Whereupon, Exhibit 19 was marked for  14 Identification.)  15 THE WITNESS: Okay. Oh, sorry. I'm  16 still -- I'm still waiting.  17 BY MR. GALLAGHER:  18 Q Okay. Did it just pop up now?  19 A It did now, yeah.  20 Q Okay. If we can share the first page  21 of this article. So this is an article by a  22 professor from the University of London,  23 Sir Austin Bradford Hill, right?  24 A Right.  25 Q And the title of the article is, "The</p>	<p style="text-align: right;">Page 164</p> <p>1 result?  2 A Yes.  3 Q Correct?  4 A That's called an association, yeah.  5 Q And the numbers -- or the variables  6 that we have been discussing today, like relative  7 risk and hazard ratio, those are a measure of  8 association, right?  9 A No, those are measures -- or they are  10 measures of effect. So you could have an effect of,  11 let's say, a hazard ratio of 10 that's -- from a  12 study that only shows an association, or it can show  13 a hazard ratio of 10 from a study that shows  14 causation.  15 So the hazard ratio and the rate ratio  16 is mainly the effect size, the -- the -- the  17 magnitude of the effect. Whether it's an  18 association or a causation comes to, you know, the  19 variables discussed by Bradford Hill and also, you  20 know, presence of confounding and all the other  21 principals that we've discussed.  22 Q Okay. And when you say it's a measure  23 of the magnitude of the effect, it's -- the hazard  24 ratio, as a variable being measured, is not of  25 itself measuring causation. You have to go through</p>



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<p>1 the...</p> <p>2 A One of the criteria set by</p> <p>3 Bradford Hill and also --</p> <p>4 THE COURT REPORTER: And also the</p> <p>5 what?</p> <p>6 THE WITNESS: There has to be an</p> <p>7 effect from the exposure to classify whether</p> <p>8 it's a -- you know, if it's -- if a drug is --</p> <p>9 has a relative risk of 1 with respect on</p> <p>10 outcome, that drug is not causing that outcome.</p> <p>11 So that -- that magnitude has to be more than</p> <p>12 1.</p> <p>13 But on top of that, that -- you know,</p> <p>14 that magnitude that's greater than 1 also has</p> <p>15 to have other criteria that Bradford Hill has</p> <p>16 talked about to be classified as a causal link.</p> <p>17 BY MR. GALLAGHER:</p> <p>18 Q Okay. Looking at the -- the first</p> <p>19 page on the right-hand column going through the nine</p> <p>20 factors that Bradford Hill lists, the first factor</p> <p>21 he lists is strength. Do you see that?</p> <p>22 A Yes.</p> <p>23 Q And so is this what -- what you're</p> <p>24 referring to in terms of the greater the magnitude</p> <p>25 of the association, the more evidence there is that</p>	<p>1 suggestive of a causal relationship without --</p> <p>2 without more, right?</p> <p>3 MR. NIGH: Object to form.</p> <p>4 THE WITNESS: Again, I disagree. It's</p> <p>5 not a -- it's not a one-size fit all sort of</p> <p>6 assumption to make. A hazard ratio of 1.5 that</p> <p>7 meets the other criteria set by Bradford Hill</p> <p>8 and also other -- it also satisfies, you know,</p> <p>9 minimal bias in terms of a study having a</p> <p>10 minimal amount of biases. One can still infer</p> <p>11 that there is a causal link. I mean, the 200</p> <p>12 times is a very rare example that he mentions,</p> <p>13 and I have never seen any drug or any exposure</p> <p>14 to having 200 times of the risk. That's an</p> <p>15 extreme.</p> <p>16 It's a good teaching example, but in</p> <p>17 real life, I have never seen anything that can</p> <p>18 cause that much of a magnitude. So that's</p> <p>19 really not a -- that level should not really be</p> <p>20 set as a -- as a sort of standard of effect</p> <p>21 sizes for causality.</p> <p>22 BY MR. GALLAGHER:</p> <p>23 Q Sure. I mean, additional --</p> <p>24 Sir Bradford Hill goes on to provide an additional</p> <p>25 example of the death rate from cancer of the lung in</p>
Page 166	Page 168
<p>1 the association may actually be a causal</p> <p>2 relationship?</p> <p>3 A Right. It's one of the criteria, yes.</p> <p>4 Q It's just one of the criteria. Okay.</p> <p>5 And Sir Bradford Hill gives an example</p> <p>6 of an association -- occupations of patients with</p> <p>7 scrotal cancer versus occupations of patients</p> <p>8 presenting with other diseases. And the mortality</p> <p>9 of chimney sweeps --</p> <p>10 THE COURT REPORTER: I'm sorry. The</p> <p>11 mortality of what?</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Of chimney sweeps from scrotal cancer</p> <p>14 was some 200 times that of workers who were not</p> <p>15 specially exposed to tar or mineral oils. Do you</p> <p>16 see that?</p> <p>17 A Yes.</p> <p>18 Q And so that's an example of a strong</p> <p>19 association where the magnitude of the observed</p> <p>20 association is high enough that it's much more</p> <p>21 suggestive of a causal relationship, right?</p> <p>22 A Right.</p> <p>23 Q And so if we're looking at hazard</p> <p>24 ratios that are perhaps above -- the observed hazard</p> <p>25 ratio is above 1, it's like 1.5, that's less</p>	<p>1 cigarette smokers as nine to ten times the rate of</p> <p>2 nonsmokers. And the death rate in heavy smokers is</p> <p>3 20 to 30 times as great, right?</p> <p>4 A Uh-huh.</p> <p>5 Q So that's just another example.</p> <p>6 I guess my only question is -- is to</p> <p>7 understand how this factor is evaluated. If you</p> <p>8 have a relative risk -- observed relative risk of</p> <p>9 1.5, that is for this factor not as suggestive for a</p> <p>10 causal relationship as if the relative risk is like</p> <p>11 for cigarette smoking, 10 times or 20 to 30 times?</p> <p>12 MR. NIGH: Object to form.</p> <p>13 THE WITNESS: No. I wouldn't say</p> <p>14 that, you can't -- if it's 1.5 and, again, all</p> <p>15 the other criteria have been met, I don't think</p> <p>16 you can say it's -- it's not causal. We can</p> <p>17 say that a relative risk of 10, again, with</p> <p>18 everything being checked in and checked out</p> <p>19 with all the other criteria, just talking about</p> <p>20 the effect size, a relative risk of 10 is -- is</p> <p>21 suggestive of a stronger causal link than the</p> <p>22 1.5. But you can disregard the 1.5 risk,</p> <p>23 especially if you're making a population,</p> <p>24 because the 1.5 risk of a disease in the large</p> <p>25 population can lead to -- even though it's a</p>

<p style="text-align: right;">Page 169</p> <p>1 small number, but it can -- because the</p> <p>2 population is large, it can lead to a</p> <p>3 significant number of cases. So I think,</p> <p>4 again, you can't generalize it in that fashion.</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q So is what you're saying is you</p> <p>7 essentially don't -- from your perspective, you</p> <p>8 don't apply this factor of evaluating the strength</p> <p>9 of the association because there -- you know, there</p> <p>10 can be an association no matter what the relative --</p> <p>11 observed relative risk is?</p> <p>12 MR. NIGH: Object to the form,</p> <p>13 mischaracterizes testimony.</p> <p>14 THE WITNESS: No. I definitely look</p> <p>15 at it -- I definitely look at event sizes, but</p> <p>16 I don't have a threshold to say, you know, if</p> <p>17 it's not close to 200, then I'm not going to</p> <p>18 consider it as a causal link. I would say</p> <p>19 again, and this is -- a lot of scientists,</p> <p>20 epidemiologists, use a relative risk of 2.</p> <p>21 Some use 1.5. I would say anything greater</p> <p>22 than 1.5 that satisfies the other criteria</p> <p>23 would be -- or higher, would be -- would</p> <p>24 satisfy this effect size criteria of</p> <p>25 Bradford Hill.</p>	<p style="text-align: right;">Page 171</p> <p>1 can include the -- and the paragraph right below</p> <p>2 that as well.</p> <p>3 So Sir Bradford Hill says that, "This</p> <p>4 requirement may be of special importance for those</p> <p>5 rare hazards singled out in the section's terms of</p> <p>6 reference," right?</p> <p>7 Do you see that?</p> <p>8 A Uh-huh.</p> <p>9 Q What is your understanding of how</p> <p>10 the -- this factor of consistency is applied?</p> <p>11 A Again, I think Bradford Hill, as you</p> <p>12 have it on -- on the screen, he mentions is -- he</p> <p>13 means by consistency, has it been repeated in</p> <p>14 different persons, in different places,</p> <p>15 circumstances. So is it perhaps consistent with</p> <p>16 being observed or seen?</p> <p>17 And so that's -- that's what I also</p> <p>18 take -- take it to mean, that is this -- is this</p> <p>19 effect that I'm seeing, has it been seen in other</p> <p>20 settings or in other studies. It doesn't mean that</p> <p>21 it has to be observed in every single study, but is</p> <p>22 it -- is it just a one-time event, or is it being</p> <p>23 observed in other settings as well.</p> <p>24 Q Okay. And so that would be like, for</p> <p>25 example, there's -- where there's multiple studies</p>
<p style="text-align: right;">Page 170</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q Okay. But you would agree with me</p> <p>3 that if the observed relative risk is 1.5, that you</p> <p>4 would want more additional information from the</p> <p>5 other factors to infer causal relationship than</p> <p>6 perhaps you would insist on if the observed relative</p> <p>7 risk was 20 or 200?</p> <p>8 A Again, the other -- the other factors</p> <p>9 are independent of the effect size. I mean, you can</p> <p>10 have an effect size of 100, but if the other factors</p> <p>11 do not satisfy -- are not satisfied, just because</p> <p>12 you have an effect size of 200, you cannot say</p> <p>13 there's a causal link because the temporality may</p> <p>14 not be there. The analogy may not be there. The</p> <p>15 biases could be there.</p> <p>16 So again, the magnitude of effect size</p> <p>17 has to be there, but there is no set standard. And</p> <p>18 it doesn't -- it's not the only variable that we</p> <p>19 look at.</p> <p>20 Q Okay. Moving on to on Page 33, the</p> <p>21 right-hand column, the second Bradford Hill factor</p> <p>22 is consistency?</p> <p>23 A Yes.</p> <p>24 Q And under "Consistency" for</p> <p>25 Bradford Hill --beneath that in the paragraph, if we</p>	<p style="text-align: right;">Page 172</p> <p>1 designed in different ways that are showing -- that</p> <p>2 are showing the same relationship, right?</p> <p>3 A Yes. And I also would include even</p> <p>4 animal studies as well, because they also -- I mean,</p> <p>5 I know that's far more biologic plausibility. But</p> <p>6 if there is studies repeating -- like, repeatedly</p> <p>7 showing that there is cancer within carcinogenic</p> <p>8 animal studies, I think that should also be part of</p> <p>9 consistency as well.</p> <p>10 Q Okay. And if you see over on Page 34,</p> <p>11 the next page, the top -- the left-hand column at</p> <p>12 the top, again discussing consistency,</p> <p>13 Sir Bradford Hill says, "I would, myself, put a good</p> <p>14 deal of weight upon similar results reached in quite</p> <p>15 different ways, e.g., prospectively and</p> <p>16 retrospectively."</p> <p>17 Do you see that?</p> <p>18 A Yeah.</p> <p>19 Q And so from -- from his perspective,</p> <p>20 looking at studies, both studies that may be looking</p> <p>21 retrospectively but also studies that are being done</p> <p>22 prospectively, is significant to him in terms of</p> <p>23 determining whether an association -- whether this</p> <p>24 factor of consistency is met, right?</p> <p>25 MR. NIGH: Object to form.</p>

<p style="text-align: right;">Page 173</p> <p>1 THE WITNESS: Yeah.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q The third factor over on the</p> <p>4 right-hand column of -- of this Page 34,</p> <p>5 specificity?</p> <p>6 A Yes.</p> <p>7 Q And this factor -- and this factor is</p> <p>8 looking at whether there's a specific association</p> <p>9 between the -- disease and an exposure; is that</p> <p>10 right?</p> <p>11 A Yes.</p> <p>12 Q And then at the bottom of Page 34, the</p> <p>13 fourth factor is temporality. So this is a question</p> <p>14 of -- of timing, right?</p> <p>15 A Yes.</p> <p>16 Q Does the -- does the exposure come</p> <p>17 before the outcome, right?</p> <p>18 A Yes.</p> <p>19 Q And with respect -- when -- when the</p> <p>20 outcome that you're looking at is cancer, for -- for</p> <p>21 temporality a part of the question would be does the</p> <p>22 exposure come before the subject gets -- gets</p> <p>23 cancer, right?</p> <p>24 A Yes.</p> <p>25 Q And there's also, specifically with</p>	<p style="text-align: right;">Page 175</p> <p>1 that can be one -- one factor that is indicative of</p> <p>2 a causal relationship, right?</p> <p>3 A Yes.</p> <p>4 Q Moving on to the bottom of that</p> <p>5 column, the sixth factor is plausibility.</p> <p>6 A Yes.</p> <p>7 Q For this factor, it's just a question</p> <p>8 of is the -- is there a suggestion that it's</p> <p>9 biologically plausible that the exposure is</p> <p>10 associated with the outcome -- or that the exposure</p> <p>11 is a causation of the outcome, right?</p> <p>12 A Yes.</p> <p>13 MR. NIGH: Form objection.</p> <p>14 THE WITNESS: It asks -- it basically</p> <p>15 asks is there a plausible mechanism for this</p> <p>16 cause to -- for this exposure to cause the</p> <p>17 outcome.</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q Okay. And then the -- the -- moving</p> <p>20 on to the right-hand column of Page 35 the seventh</p> <p>21 factor is coherence. In your mind, how is coherence</p> <p>22 different from plausibility?</p> <p>23 A So coherence to me is whether --</p> <p>24 whether there is a length between the plausibility,</p> <p>25 the basic science studies, and the --</p>
<p style="text-align: right;">Page 174</p> <p>1 respect to cancer, because it can be slower to</p> <p>2 develop, typically subjects are exposed to many</p> <p>3 factors, including environmental factors, that come</p> <p>4 before they develop cancer?</p> <p>5 MR. NIGH: Object to form.</p> <p>6 THE WITNESS: Well, I mean,</p> <p>7 temporality is just focusing on does the</p> <p>8 exposure come before the outcome, really. It's</p> <p>9 not talking about one exposure, different</p> <p>10 exposure. It's -- I mean, obviously, if -- if</p> <p>11 the exposure came after the outcome, then</p> <p>12 that's -- there's no causal link. So there has</p> <p>13 to be -- the exposure has to come before the</p> <p>14 outcome to -- to show a cause and effect</p> <p>15 relationship.</p> <p>16 BY MR. GALLAGHER:</p> <p>17 Q Okay. Going on to Page 35, the fifth</p> <p>18 factor is called biological gradient.</p> <p>19 A Yes.</p> <p>20 Q This is referring to essentially a</p> <p>21 dose response relationship; is that right?</p> <p>22 A Yes.</p> <p>23 Q That the greater the level of</p> <p>24 exposure -- if the -- if the risk of the outcome</p> <p>25 increases with increase in the level of exposure,</p>	<p style="text-align: right;">Page 176</p> <p>1 THE COURT REPORTER: I'm sorry. The</p> <p>2 what and the clinical studies?</p> <p>3 THE WITNESS: If -- if there is a --</p> <p>4 if there is a link or there is a nice flow, if</p> <p>5 you will, from the basic science animal studies</p> <p>6 and the clinical/epidemiological studies.</p> <p>7 BY MR. GALLAGHER:</p> <p>8 Q Okay. Moving on to the bottom of</p> <p>9 this, Page 35, in the right-hand column, the eighth</p> <p>10 factor is experiment. And essentially this is</p> <p>11 looking for experimental evidence, right?</p> <p>12 A Yeah.</p> <p>13 Q And that's experimental evidence</p> <p>14 that's different from -- it's not looking at an</p> <p>15 observational study but a true experiment or</p> <p>16 randomized control trial, right?</p> <p>17 MR. NIGH: Form objection.</p> <p>18 THE WITNESS: Yeah. I mean, again, I</p> <p>19 don't think it's clear enough on that, but most</p> <p>20 people take it to mean that it means a true</p> <p>21 experiment and, you know, in a randomized trial</p> <p>22 or an RCT.</p> <p>23 Q And then on -- going on to Page 36,</p> <p>24 the ninth -- the ninth factor is analogy, right?</p> <p>25 A Yes.</p>

<p style="text-align: right;">Page 177</p> <p>1 Q And this is just a question of are</p> <p>2 there -- I guess, what's your understanding of how</p> <p>3 this factor of analogy is applied?</p> <p>4 A I'm just going to refer to my report</p> <p>5 just to refresh my memory.</p> <p>6 Q Sure. It's on Page 27.</p> <p>7 A Right. So analogy means that is there</p> <p>8 any evidence that carcinogens that are similar</p> <p>9 chemically, you know, similar in the chemical</p> <p>10 structure of the carcinogen in question also cause</p> <p>11 cancer. So sometimes people refer to it as a class</p> <p>12 effect, for example. So if one drug can cause an</p> <p>13 adverse event, then that -- sometimes, it's a class</p> <p>14 effect so that the group of drugs in that class of</p> <p>15 drugs can also cause that adverse event, which</p> <p>16 strengthens the analogy -- analogy argument.</p> <p>17 But it generally means whether -- if</p> <p>18 we talk about the carcinogen, whether other</p> <p>19 carcinogens that are similar in structure also --</p> <p>20 have also shown to cause cancer.</p> <p>21 Q Okay. Let's go up ahead and pull up</p> <p>22 your report, section -- report Page 29, and we can</p> <p>23 look at the table. And if you want to refer back to</p> <p>24 Pages 27 or 28, please -- you know, please feel free</p> <p>25 to.</p>	<p style="text-align: right;">Page 179</p> <p>1 referred to the studies that suggest that there</p> <p>2 may -- that there was not a statistically</p> <p>3 significant observation of an association, right?</p> <p>4 MR. NIGH: Form objection.</p> <p>5 THE WITNESS: Again, we have talked</p> <p>6 about statistical significance. It's not a --</p> <p>7 it's not a -- statistical significance has not</p> <p>8 -- has nothing to do with the Bradford Hill</p> <p>9 criteria.</p> <p>10 I have included the Hidajat because I</p> <p>11 felt that it satisfies this criteria more than</p> <p>12 the -- in this table. But I have included</p> <p>13 the -- the data from the dietary studies in my</p> <p>14 assessment from all the variables as well.</p> <p>15 BY MR. GALLAGHER:</p> <p>16 Q And the data -- the data that you're</p> <p>17 showing for strength of evidence, I guess -- where</p> <p>18 are you getting that data from? That's just --</p> <p>19 strike that.</p> <p>20 The data that you're presenting for</p> <p>21 strength of evidence is just the odds ratios that</p> <p>22 were reported from the Hidajat study, right?</p> <p>23 A It's the hazard ratios of the highest</p> <p>24 versus lowest NDMA categories.</p> <p>25 Q From the Hidajat study, right?</p>
<p style="text-align: right;">Page 178</p> <p>1 So I guess -- Sir Bradford Hill</p> <p>2 presented these -- one question -- Sir Bradford Hill</p> <p>3 presented these factors in a -- in a particular</p> <p>4 order. The first being strength, then consistency,</p> <p>5 then specificity, then temporality, then biological</p> <p>6 gradient, then plausibility, then coherence, then</p> <p>7 experiment and then analogy, right?</p> <p>8 A Right.</p> <p>9 Q And you haven't followed that -- that</p> <p>10 pattern. Is there any particular why -- particular</p> <p>11 reason why?</p> <p>12 MR. NIGH: Form objection.</p> <p>13 THE WITNESS: No, I don't think -- I</p> <p>14 don't think the pattern is important. I think</p> <p>15 it's the presence or the status of these</p> <p>16 variables that's important, not -- not -- I</p> <p>17 mean, it's not a temporal exercise. It's</p> <p>18 whether this variable exists, whether an</p> <p>19 analogy exists, whether temporality exists.</p> <p>20 BY MR. GALLAGHER:</p> <p>21 Q Okay. With respect to -- with respect</p> <p>22 to the data that's in here, you've only included the</p> <p>23 Hidajat study, right?</p> <p>24 A Yes.</p> <p>25 Q You haven't included the studies or</p>	<p style="text-align: right;">Page 180</p> <p>1 A Yes. Yes. It actually says in it on</p> <p>2 the -- on the bottom of the table.</p> <p>3 Q Sure. So are you looking at the first</p> <p>4 footnote, I guess, where there's the carat?</p> <p>5 A Yes.</p> <p>6 Q The numbers are --</p> <p>7 THE COURT REPORTER: I'm sorry. The</p> <p>8 numbers are what?</p> <p>9 MR. GALLAGHER: Numbers are from the</p> <p>10 study by Hidajat only.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q Is that correct?</p> <p>13 A Yes.</p> <p>14 Q And that carat is actually next to</p> <p>15 dose response. And dose response is presented --</p> <p>16 these data I think as you said, is the hazard ratio</p> <p>17 of the NDEA --</p> <p>18 A Yes. I mean, the dose response</p> <p>19 analysis is -- is the strength of the evidence,</p> <p>20 because they only, pretty much, did a dose response.</p> <p>21 So they -- they don't have a category of just other</p> <p>22 use -- you know, other risks of cancer with NDMA.</p> <p>23 They looked at a dose response, so that's -- that's</p> <p>24 why I could see the numbers duplicated because</p> <p>25 they're pretty much the same.</p>

<p style="text-align: right;">Page 181</p> <p>1 Q So you essentially treated those --</p> <p>2 you treated those factors as the same, not</p> <p>3 different?</p> <p>4 A Right.</p> <p>5 MR. NIGH: Form objection.</p> <p>6 BY MR. GALLAGHER:</p> <p>7 Q In evaluating coherence, if we blow up</p> <p>8 on Page 29, Section IX, which is just above the</p> <p>9 table.</p> <p>10 A Yes.</p> <p>11 Q So you explain that from your</p> <p>12 perspective, coherence examines whether there's a</p> <p>13 link or coherence between basic science and</p> <p>14 epidemiological evidence, right?</p> <p>15 A Yes.</p> <p>16 Q And then in your -- but then in</p> <p>17 applying that, you say, "All nine cancers have been</p> <p>18 shown to have a causal link from well-designed large</p> <p>19 epidemiologic, occupational and scientific studies."</p> <p>20 It seems like you're assuming a causal</p> <p>21 link from the epidemiologic, occupational and</p> <p>22 scientific studies, right?</p> <p>23 MR. NIGH: Form objection.</p> <p>24 THE WITNESS: Well, that's -- I mean,</p> <p>25 that's -- that's where my -- I mean, I talk</p>	<p style="text-align: right;">Page 183</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q Right. But how -- how are you</p> <p>3 applying coherence here?</p> <p>4 MR. NIGH: Form objection.</p> <p>5 THE WITNESS: I am -- I am -- I'm</p> <p>6 stating that there -- because there is a link</p> <p>7 -- there is a causal link in terms of strength,</p> <p>8 temporality, biologic plausibility, that</p> <p>9 satisfies the coherence or the flow between the</p> <p>10 basic science data and the clinical data.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q Okay. The data that you had looked</p> <p>13 at, though, were epidemiologic, occupational --</p> <p>14 well, let's break those down.</p> <p>15 Epidemiologic and occupational</p> <p>16 studies, so those are like the Hidajat study, Straif</p> <p>17 study, right, the occupational studies? Those are a</p> <p>18 couple of occupational studies that you looked at?</p> <p>19 MR. NIGH: Form objection, incomplete</p> <p>20 question.</p> <p>21 You can answer.</p> <p>22 THE WITNESS: And -- and the dietary</p> <p>23 studies, yes.</p> <p>24 BY MR. GALLAGHER:</p> <p>25 Q Okay. So the dietary studies would be</p>
<p style="text-align: right;">Page 182</p> <p>1 about this in my opinion. Here, I use the word</p> <p>2 "causal" because they -- you know, if you look</p> <p>3 at the strength of the -- of the evidence and</p> <p>4 ratios and also the other -- the categories of</p> <p>5 Bradford Hill, they do satisfy the -- the</p> <p>6 different categories. And that's why I -- I</p> <p>7 use the word "causal."</p> <p>8 Because when you get to coherence,</p> <p>9 then I have also looked at biologic</p> <p>10 plausibility, and analogy and all the other --</p> <p>11 this -- this is the last criteria. So I have</p> <p>12 already looked at all the other criterion and</p> <p>13 have, you know, determined my -- my opinion</p> <p>14 that I do believe there is causal link.</p> <p>15 BY MR. GALLAGHER:</p> <p>16 Q So you're not applying coherence. By</p> <p>17 the time you get here, you've decided there's a</p> <p>18 causal link, and it's based specifically on the</p> <p>19 strength of the association. That's what you said?</p> <p>20 MR. NIGH: Form objection,</p> <p>21 mischaracterizes his testimony.</p> <p>22 THE WITNESS: No. I disagree with</p> <p>23 that. By the time I got to coherence, I have</p> <p>24 looked at the other criteria as well.</p> <p>25</p>	<p style="text-align: right;">Page 184</p> <p>1 epidemiologic studies; is that right?</p> <p>2 A Yes.</p> <p>3 Q Okay. The dietary studies are not</p> <p>4 occupational studies, right?</p> <p>5 A No.</p> <p>6 Q What are the basic scientific studies</p> <p>7 that you're --</p> <p>8 A Those are the animal studies that have</p> <p>9 shown NDMA can cause cancer.</p> <p>10 Q If we go back to Page 28, looking at</p> <p>11 consistency, it's labeled VI.</p> <p>12 A Uh-huh.</p> <p>13 Q So, again, explain to me how you --</p> <p>14 how you've applied consistency here?</p> <p>15 A Consistency means that there is basic</p> <p>16 science evidence suggesting of cancer, the</p> <p>17 causing -- the cancer-causing effects of NDMA in</p> <p>18 animals, and the occupational studies, mainly</p> <p>19 Hidajat. And many of the dietary epi studies have</p> <p>20 also shown that the -- the risk of cancer is</p> <p>21 increased. So that's the consistency.</p> <p>22 Q So you say -- you say, mainly Hidajat.</p> <p>23 And in terms of consistency from Sir Bradford Hill,</p> <p>24 it seems like he was wanting -- be wanting to look</p> <p>25 at all of the studies, including studies that were</p>



<p style="text-align: right;">Page 185</p> <p>1 prospective and retrospective, right?</p> <p>2 MR. NIGH: Form objection.</p> <p>3 THE WITNESS: Hidajat was prospective,</p> <p>4 it was a prospective cohort where they followed</p> <p>5 men for 35 years. We have the dietary studies</p> <p>6 where they're a mixture, a mix of prospective</p> <p>7 and retrospective. And Bradford Hill does not</p> <p>8 say that -- he says there has to be evidence</p> <p>9 from, as you said, prospective and</p> <p>10 retrospective.</p> <p>11 He doesn't say there has to be, you</p> <p>12 know, a consistent increase in risk in of all</p> <p>13 of the studies that you have. He's just</p> <p>14 suggesting that there has to be evidence from a</p> <p>15 mix of studies, which we do have here.</p> <p>16 BY MR. GALLAGHER:</p> <p>17 Q So wouldn't it be relevant to this</p> <p>18 factor of consistency, if there are studies that --</p> <p>19 some studies show -- in some studies, they reach</p> <p>20 statistical significance or an association, but that</p> <p>21 there's other studies where there's no statistically</p> <p>22 significant association? Isn't that inconsistent</p> <p>23 results?</p> <p>24 A Again, a statistical significant has</p> <p>25 nothing to do with either the Bradford Hill criteria</p>	<p style="text-align: right;">Page 187</p> <p>1 interpretation of this, Doctor, is that</p> <p>2 Bradford Hill is not requiring that the studies</p> <p>3 consistently show the same observed association?</p> <p>4 MR. NIGH: Objection, form and</p> <p>5 mischaracterizes his testimony.</p> <p>6 THE WITNESS: Let me clarify. I'm</p> <p>7 just reading from what he's saying. "I would</p> <p>8 myself put a good deal of weight upon similar</p> <p>9 results reached in quite different ways, e.g.,</p> <p>10 prospective and" -- "prospectively and</p> <p>11 retrospectively."</p> <p>12 And so -- so this -- I mean, this</p> <p>13 report and the findings does meet this</p> <p>14 criteria. I have retrospective studies and</p> <p>15 prospective studies. And it doesn't talk about</p> <p>16 the statistical significance or anything like</p> <p>17 that at all.</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q Well, but wouldn't it be relevant --</p> <p>20 wouldn't it be relevant to this, Doctor, if there</p> <p>21 are some studies that are concluding evidence of an</p> <p>22 association based on statistical significance, but</p> <p>23 there's other studies that are concluding no</p> <p>24 evidence of an association?</p> <p>25 MR. NIGH: Form objection.</p>
<p style="text-align: right;">Page 186</p> <p>1 or consistency. And I think I've -- I've talked</p> <p>2 about the caveats of interpreting statistical</p> <p>3 significance. So if you'd just give me a few</p> <p>4 minutes, and I'll just read consistency from his</p> <p>5 paper again.</p> <p>6 Q Sure.</p> <p>7 A I mean mainly what it says is, "I</p> <p>8 would myself put a good deal of weight upon similar</p> <p>9 results" from prospective and retrospective studies.</p> <p>10 Again, it doesn't say that all of</p> <p>11 these results have to be consistently showing an</p> <p>12 increased risk with that particular exposure. So</p> <p>13 he's -- he's quite -- he's quite general in his</p> <p>14 statement, and we do have in this question a mixture</p> <p>15 of prospective and retrospective epi -- epi and</p> <p>16 occupational studies.</p> <p>17 Q So I'm not following. I think you</p> <p>18 said he's not requiring that the results are</p> <p>19 consistently showing the same --</p> <p>20 A He's not --</p> <p>21 MR. NIGH: Hold on. Let him finish</p> <p>22 his question.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q I'll start over.</p> <p>25 I heard you to say that your</p>	<p style="text-align: right;">Page 188</p> <p>1 THE WITNESS: Again -- the</p> <p>2 Bradford Hill criteria is a method of looking</p> <p>3 at the totality of the evidence. You're rarely</p> <p>4 going to have a situation where all the studies</p> <p>5 that you have are consistently showing at one</p> <p>6 direction with minimal limitations. You're</p> <p>7 gonna have a mixed bag.</p> <p>8 And I think that's why his -- I mean,</p> <p>9 the bar is quite low from what he's saying. He</p> <p>10 says, I want to see the, you know, results from</p> <p>11 a mix of prospective and retrospective. He's</p> <p>12 not going into any detail about, you know, what</p> <p>13 if some of them are negative, some of them are</p> <p>14 positive, what's the statistical significance.</p> <p>15 That's -- that's not -- at least that's not how</p> <p>16 I read it.</p> <p>17 BY MR. GALLAGHER:</p> <p>18 Q So from your perspective, this factor</p> <p>19 of consistency, it's not relevant if, among the</p> <p>20 studies that are being -- that have evaluated the</p> <p>21 question, some of them are positive and some of them</p> <p>22 are negative?</p> <p>23 MR. NIGH: Object to form,</p> <p>24 mischaracterizes testimony.</p> <p>25 THE WITNESS: I think I -- I think the</p>

<p style="text-align: right;">Page 189</p> <p>1 ones that have the highest weight and the</p> <p>2 stronger methodology, I think if those studies</p> <p>3 are showing an association -- plus there's, you</p> <p>4 know, evidence from animal studies. And as he</p> <p>5 says there's a mixed bag of prospective and</p> <p>6 retrospective. That to me, has satisfied his</p> <p>7 criteria.</p> <p>8 Q So again, if there's -- if there's a</p> <p>9 mixed bag of some studies are positive and some</p> <p>10 studies are negative, wouldn't you consider that to</p> <p>11 be evidence of inconsistency?</p> <p>12 MR. NIGH: Object to form.</p> <p>13 THE WITNESS: In most situations,</p> <p>14 you're gonna have a mixed bag of studies, as I</p> <p>15 mentioned. If -- if you wanted to apply</p> <p>16 Bradford Hill to just questions that have only</p> <p>17 positive studies, you wouldn't -- you wouldn't</p> <p>18 be applying it a lot. So it all depends if the</p> <p>19 mixed bag, what -- you know, what -- what</p> <p>20 quality of evidence comes from those -- those</p> <p>21 mixed studies.</p> <p>22 And here, I think that the study by</p> <p>23 Hidajat, has, you know, perhaps a high end</p> <p>24 rate. Plus the studies, the epi studies, and</p> <p>25 plus the data from animal studies, satisfy the</p>	<p style="text-align: right;">Page 191</p> <p>1 Page 2519. It's the fourth page of the article.</p> <p>2 MR. NIGH: Form objection.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q On the left-hand side.</p> <p>5 Do you see that where you're</p> <p>6 describing the quality assessment that you had done?</p> <p>7 A Yes.</p> <p>8 Q And in that quality assessment, you</p> <p>9 came up with a series of criteria that were used to</p> <p>10 rank the quality of each of the studies; is that</p> <p>11 right?</p> <p>12 A Yes.</p> <p>13 Q And you would have come up with this</p> <p>14 quality assessment before deciding which -- which</p> <p>15 studies were of higher quality and which were of</p> <p>16 lower quality, right?</p> <p>17 MR. NIGH: Form objection.</p> <p>18 THE WITNESS: Usually, that's what</p> <p>19 quality assessments are done for, yes, used</p> <p>20 for.</p> <p>21 BY MR. GALLAGHER:</p> <p>22 Q Okay. Okay. You haven't described</p> <p>23 that type of quality assessment in your report for</p> <p>24 evaluating the -- the studies that you decided to</p> <p>25 include on which to base your opinions, have you?</p>
<p style="text-align: right;">Page 190</p> <p>1 consistency criteria.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Okay. Let's go to -- let's go to the</p> <p>4 exhibit we were looking at early this morning, the</p> <p>5 article you had written about personal use of hair</p> <p>6 dyes and risk of cancer.</p> <p>7 A Can you please -- can you please</p> <p>8 upload that again?</p> <p>9 Q Sure.</p> <p>10 MR. GALLAGHER: Can you put that back</p> <p>11 in the chat?</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Do you have it?</p> <p>14 A Yes.</p> <p>15 Q Okay. We had looked at this this</p> <p>16 morning, and in this paper, you walk through the way</p> <p>17 you structured the searches for this, right?</p> <p>18 A Yes.</p> <p>19 Q And then you established -- you</p> <p>20 established inclusion criteria for collecting the</p> <p>21 data, right?</p> <p>22 A Yes.</p> <p>23 Q And then you set forth the way in</p> <p>24 which you did a quality assessment of the studies</p> <p>25 that were inclusive, right? And this is on</p>	<p style="text-align: right;">Page 192</p> <p>1 MR. NIGH: Form objection.</p> <p>2 THE WITNESS: I did not, because first</p> <p>3 of all, as you can see here, we have a lot of</p> <p>4 studies, that needs to be sifted through with</p> <p>5 different methodologies. In this case, I was</p> <p>6 mainly faced with two types of studies.</p> <p>7 Hidajat was one, and then the rest are all</p> <p>8 dietary studies with dietary questionnaires and</p> <p>9 very similar design.</p> <p>10 So I preferred to kind of describe the</p> <p>11 methodology, the limitations and strengths</p> <p>12 rather than, you know, come up with a</p> <p>13 quality -- quality score.</p> <p>14 BY MR. GALLAGHER:</p> <p>15 Q So you haven't gone through this --</p> <p>16 sorry -- this -- of having criteria to evaluate</p> <p>17 these studies that you're relying on for quality,</p> <p>18 and then --</p> <p>19 A No. And again -- another -- another</p> <p>20 reason is this --</p> <p>21 MR. NIGH: Sorry. We couldn't hear</p> <p>22 the question because someone coughed. And that</p> <p>23 happens, I know. But can you please ask that</p> <p>24 question again?</p> <p>25 MR. GALLAGHER: Sure. No worries.</p>

<p style="text-align: right;">Page 193</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q So you haven't -- you haven't gone</p> <p>3 through the process of having criteria to evaluate</p> <p>4 the quality of the studies that you're including in</p> <p>5 your report on which your opinions are based,</p> <p>6 prospectively to describe the quality of each of</p> <p>7 them, right?</p> <p>8 A Right. And I believe I did reply as</p> <p>9 to why. And if I could also add, qualities --</p> <p>10 although it was done here, and this was a quality</p> <p>11 score that we just came up ourselves, it's not a</p> <p>12 standardized quality score that's published. We</p> <p>13 just came up with it ourselves.</p> <p>14 But there's really no evidence that a</p> <p>15 quality score would necessarily improve the quality</p> <p>16 of the review when -- you know, when the strengths</p> <p>17 and limitations of the studies in the review are</p> <p>18 discussed and sort of analyzed. And with the fact</p> <p>19 that, again, the studies are very similar in design,</p> <p>20 I choose not to use the quality score.</p> <p>21 Q Okay. When you say "they are similar</p> <p>22 in design," I thought we had discussed earlier this</p> <p>23 morning, that all of the studies have different</p> <p>24 designs, right?</p> <p>25 A Well --</p>	<p style="text-align: right;">Page 195</p> <p>1 sound good for observational reviews, have not</p> <p>2 really shown to improve the -- you know, to</p> <p>3 change the quality of the review if that review</p> <p>4 does contain a formal discussion of the</p> <p>5 limitations and strengths of the studies</p> <p>6 included.</p> <p>7 BY MR. GALLAGHER:</p> <p>8 Q Okay. Can we look at the Straif paper</p> <p>9 again?</p> <p>10 A Sorry, which paper?</p> <p>11 Q Exhibit 7, Straif.</p> <p>12 This was another occupational study</p> <p>13 looking at the workers in the rubber industry,</p> <p>14 right?</p> <p>15 A Yes.</p> <p>16 Q On Page 19 of your report, you're</p> <p>17 looking -- you're discussing your opinion with</p> <p>18 respect to pancreatic cancer?</p> <p>19 A Yes.</p> <p>20 Q And you -- you criticize the Straif</p> <p>21 study as being, in your opinion, underpowered to</p> <p>22 examine pancreatic cancer deaths, right?</p> <p>23 A Yes.</p> <p>24 Q And that's because there were only 15</p> <p>25 pancreatic cancer deaths in the cohort for the</p>
<p style="text-align: right;">Page 194</p> <p>1 MR. NIGH: Form objection. Form</p> <p>2 objection.</p> <p>3 Go ahead. You can answer.</p> <p>4 THE WITNESS: So, you have -- you have</p> <p>5 pretty much one occupational study that I</p> <p>6 relied on, and that's in Hidajat. And I talked</p> <p>7 about that extensively in more than a couple of</p> <p>8 pages. And then -- so that's obviously</p> <p>9 different than the epi studies.</p> <p>10 But then the epi studies are pretty</p> <p>11 much very similar in design. That's what I</p> <p>12 meant. So you have two types of designs,</p> <p>13 occupational and epi. And then the epi are</p> <p>14 very similar in design. They are all</p> <p>15 questionnaire-based dietary studies.</p> <p>16 So if I had a number of randomized</p> <p>17 trials, a number of occupational studies, a</p> <p>18 number of dietary epi studies and number of</p> <p>19 studies on different designs, then that may</p> <p>20 have warranted a quality score.</p> <p>21 But because of the small number of</p> <p>22 studies and -- and the -- and the fact that I</p> <p>23 felt I could describe them, the strengths and</p> <p>24 limitations and the fact that really, quality</p> <p>25 scores, although intuitively, they look -- they</p>	<p style="text-align: right;">Page 196</p> <p>1 Straif study, right?</p> <p>2 MR. NIGH: Form objection.</p> <p>3 THE WITNESS: Right.</p> <p>4 BY MR. GALLAGHER:</p> <p>5 Q So isn't it -- isn't it the case that</p> <p>6 at least for the cohort that Straif was looking at,</p> <p>7 there weren't very many members of that cohort that</p> <p>8 had pancreatic cancer or died from pancreatic</p> <p>9 cancer, right?</p> <p>10 MR. NIGH: Object to form.</p> <p>11 THE WITNESS: So 15 cases only.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Right. So the -- the powering of the</p> <p>14 study is -- is based largely off of sample size, and</p> <p>15 the expected size of a potential association, right?</p> <p>16 MR. NIGH: Form. Form objection.</p> <p>17 THE WITNESS: So there are about four</p> <p>18 criteria for the power. One of them is sample</p> <p>19 size or, more specifically, number of events.</p> <p>20 BY MR. GALLAGHER:</p> <p>21 Q Okay. If you look -- let's look at</p> <p>22 the Straif study, on Page 181, in the right-hand</p> <p>23 column just above the table.</p> <p>24 A Okay.</p> <p>25 Q Do you see where they're describing</p>

<p style="text-align: right;">Page 197</p> <p>1 for this cohort, they "assessed exposure to total 2 nitrosamine because animal studies indicated linear 3 additive carcinogenicity for exposure to low 4 concentrations of different nitrosamines and because 5 assessment of exposure to specific nitrosamines 6 would not have been possible." Right? 7 A Okay. 8 Q So for this -- for this study, 9 assessment of the exposure to specific nitrosamines 10 would not have been possible, right? 11 A Right. 12 Q If we go to Page 185 in the left-hand 13 column, the -- the top, the first full sentence, 14 they state, "We have discussed previously that the 15 increased risk of stomach cancer among rubber 16 workers was mostly found in work areas with 17 relatively low exposure to nitrosamine." 18 Do you see that? 19 A What page is that? I'm trying to look 20 at in my PDF. What page is that? 21 Q Sure. It's Page 185. 185, the top 22 left-hand column. Do you see that sentence where 23 they -- 24 A Yes. 25 Q -- say, "We have discussed previously</p>	<p style="text-align: right;">Page 199</p> <p>1 cancer among rubber workers was mostly found in work 2 areas with relatively low exposure to nitrosamines, 3 right? 4 MR. NIGH: Form objection. 5 THE WITNESS: Again, even -- even in 6 this study, they only have 44 cases of stomach 7 cancer deaths, which leads to -- you know, as 8 expected, a very wide confidence interval. 9 So if -- if that study that they're 10 mentioning is similar to this study, it may be 11 because, again, it -- it was a very low -- in a 12 small number of stomach cancer cases. And 13 unlike Hidajat, it did not control for death by 14 other causes. 15 So, yes, that's what they're saying, 16 but I don't -- I'm not sure if I, you know, 17 believe their -- their methodology. 18 BY MR. GALLAGHER: 19 Q Okay. Back to your report, Page 19 20 over to Page 20? 21 A I'm sorry. Can I just mention -- can 22 we -- after you ask your question on Page 19, can we 23 take a ten-minute break? 24 Q Sure. Absolutely. 25 Let me just ask this quick question,</p>
<p style="text-align: right;">Page 198</p> <p>1 that the increased risk of stomach cancer among 2 rubber workers was mostly found in work areas with 3 relatively low exposure to nitrosamine?" 4 A Right. And they reference two 5 studies. Okay. 6 Q So wouldn't that be inconsistent with 7 a suggestion that among rubber workers, it was 8 nitrosamine that was leading to an increased risk of 9 stomach cancer? 10 MR. NIGH: Form objection. 11 THE WITNESS: First of all, 12 nitrosamines are a more general, as you know, 13 chemical name that includes NDMA. 14 And I mean, here, I'm just reading one 15 sentence from the paper. I have to go and read 16 the paper and see whether I believe those 17 results or not. So I mean, that's what they're 18 saying. I can't just go with what they're 19 saying. I haven't reviewed those two articles. 20 BY MR. GALLAGHER: 21 Q Okay. But -- but at least these 22 authors who are reporting in this study that you 23 have chosen to include -- include in your report are 24 describing that from their perspective, they have 25 previously shown that any increased risk of stomach</p>	<p style="text-align: right;">Page 200</p> <p>1 and then -- and then we'll take a break. 2 So you discount the Straif study and 3 are relying on the Hidajat study with respect to 4 your opinions for pancreatic cancer, right? 5 MR. NIGH: Form objection. 6 THE WITNESS: For pancreatic cancer, I 7 also do mention the Zheng study and I mention 8 the Fritz -- Fritschi study. 9 Q What's the -- what's the second study 10 you just referred to, Fritschi? 11 A Yeah. 12 Q Well, the -- the Fritschi study, 13 F-r-i-t-s-c-h-i, you'll agree with me did not find 14 an association -- 15 A That's correct. 16 Q -- between nitrosamines and pancreatic 17 cancer, right? 18 A That's right. 19 Q And you discounted the Straif study, 20 which also did not show an association of NDMA -- or 21 of nitrosamines and pancreatic cancer, right? 22 MR. NIGH: Form objection. 23 BY MR. GALLAGHER: 24 Q And you do rely on the Hidajat study 25 in support of your opinion regarding the association</p>

<p style="text-align: right;">Page 201</p> <p>1 of NDMA and pancreatic cancer, right?</p> <p>2 A And -- and Zheng.</p> <p>3 Q Sure. Okay. I'll get to Zheng in a</p> <p>4 minute.</p> <p>5 A Okay.</p> <p>6 Q So -- but the Hidajat study as we</p> <p>7 discussed earlier today, was one of occupational</p> <p>8 exposure where the exposure is primarily inhalation</p> <p>9 or contact through skin, right?</p> <p>10 A Yes.</p> <p>11 Q Okay.</p> <p>12 MR. GALLAGHER: Why don't we take a</p> <p>13 ten-minute break now, and we'll pick up with</p> <p>14 the Zheng study when we come back.</p> <p>15 THE WITNESS: Sure.</p> <p>16 THE VIDEOGRAPHER: The time is now</p> <p>17 2:30. This ends Media Unit Number 4. We're</p> <p>18 going off the record.</p> <p>19 (Whereupon, a short break was taken.)</p> <p>20 THE VIDEOGRAPHER: The time is now</p> <p>21 2:49. This begins Media Unit Number 5. We're</p> <p>22 back on the record.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q Dr. Etminan, I'm going to mark as</p> <p>25 Exhibit 20 an article by Zheng, Z-h-e-n-g entitled</p>	<p style="text-align: right;">Page 203</p> <p>1 So it's number, which one, sorry.</p> <p>2 Q It's Exhibit 20.</p> <p>3 A Is it uploaded?</p> <p>4 Q I believe it is now.</p> <p>5 A All right.</p> <p>6 Q Do you see it?</p> <p>7 A Yes, I see it.</p> <p>8 Q Okay. If we go to Page 258, Table 2.</p> <p>9 A Yeah.</p> <p>10 Q And Table 2 is presenting "Adjusted</p> <p>11 odds ratios and 95 percent confidence intervals for</p> <p>12 pancreatic cancer risk according to quartiles of</p> <p>13 consumption of certain N-nitroso compounds," right?</p> <p>14 A That's right.</p> <p>15 Q And if we -- if you look down to NDMA,</p> <p>16 the adjusted odds ratio for NDMA exposure as -- in</p> <p>17 association with pancreatic cancer is 0.13, right?</p> <p>18 A Yes.</p> <p>19 Q That's essentially evidence of no</p> <p>20 association between exposure to NDMA and risk of</p> <p>21 pancreatic cancer in this study, right?</p> <p>22 A For the general NDMA, yes.</p> <p>23 Q Okay. For the general NDMA. And then</p> <p>24 if we look at -- it also separately presents an odds</p> <p>25 ratio for NDMA from plant source, right?</p>
<p style="text-align: right;">Page 202</p> <p>1 "Dietary N-nitroso Compounds and Risk of Pancreatic</p> <p>2 Cancer: Results From a Large Case Control Study."</p> <p>3 (Whereupon, Exhibit 20 was marked for</p> <p>4 Identification.)</p> <p>5 THE WITNESS: Which exhibit is this?</p> <p>6 Sorry, 37?</p> <p>7 Q Exhibit 20.</p> <p>8 A Oh, 20. Okay.</p> <p>9 Q It's Exhibit 20. It is -- you have</p> <p>10 cited it on Page 20 of your report, and it's</p> <p>11 Reference 37 from -- from your report.</p> <p>12 If we go to Page 258, Table 2?</p> <p>13 A I'm sorry. Can you just give me</p> <p>14 30 seconds to find this in my report?</p> <p>15 Q Sure. It's on Page 20 of your report.</p> <p>16 A Oh, 20, okay.</p> <p>17 Q And if you want we can -- sorry to --</p> <p>18 we can --</p> <p>19 A On Page 20 is -- on Page 20, I talk</p> <p>20 about Zheng and Straif, Loh. I don't see Jane.</p> <p>21 Q Z-h-e-n-g.</p> <p>22 A Oh, Zheng.</p> <p>23 Q Sorry. My apologies if I'm</p> <p>24 mispronouncing it.</p> <p>25 A That's all right.</p>	<p style="text-align: right;">Page 204</p> <p>1 A Yes.</p> <p>2 Q And the adjusted odds ratio for NDMA</p> <p>3 from plant sources is 1.93; is that right?</p> <p>4 A Yeah.</p> <p>5 Q And then separately, it breaks out</p> <p>6 NDMA from animal sources and the adjusted odds ratio</p> <p>7 for risk of pancreatic cancer and exposure to NDMA</p> <p>8 having an association of 1.7, right?</p> <p>9 A Right.</p> <p>10 Q So for exposure to NDMA from animal</p> <p>11 sources that's, again, evidence of no association</p> <p>12 between exposure to NDMA from animal sources and</p> <p>13 risk of pancreatic cancer, right?</p> <p>14 A Yeah.</p> <p>15 Q So don't you think these results</p> <p>16 are -- at a minimum, the results for plant NDMA from</p> <p>17 plant sources are inconsistent with the results for</p> <p>18 NDMA and results for NDMA from animal sources,</p> <p>19 right?</p> <p>20 MR. NIGH: Form objection.</p> <p>21 THE WITNESS: It is inconsistent, but</p> <p>22 I think that's something that should be -- I</p> <p>23 mean, you can't disregard it. I mean, they</p> <p>24 are -- they are not consistent. But if you</p> <p>25 can't -- you can't disregard the fact that</p>



<p style="text-align: right;">Page 205</p> <p>1 there is a signal with plant sources, but of</p> <p>2 course, not with NDMA from animal sources.</p> <p>3 BY MR. GALLAGHER:</p> <p>4 Q Okay. And -- and we also can't</p> <p>5 disregard that the data for NDMA is showing no</p> <p>6 association of exposure to NDMA and risk of</p> <p>7 pancreatic cancer, right?</p> <p>8 MR. NIGH: Form objection.</p> <p>9 THE WITNESS: Well, it -- it -- it</p> <p>10 shows -- it doesn't show a risk for general</p> <p>11 NDMA, right.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Okay. You'd agree with me that the</p> <p>14 exposure to NDMA from valsartan is not exposure to</p> <p>15 NDMA from plant sources, right?</p> <p>16 MR. NIGH: Object to form.</p> <p>17 THE WITNESS: And it's not from</p> <p>18 animals either. But I mean, the molecule --</p> <p>19 the molecule is the molecule. So I don't know</p> <p>20 if -- whether it comes from the plant -- I</p> <p>21 mean, it comes from the plant. But in the</p> <p>22 body, it gets broken down to the chemical NDMA.</p> <p>23 So whether it comes from a plant or any other</p> <p>24 source, I don't think that really matters that</p> <p>25 much.</p>	<p style="text-align: right;">Page 207</p> <p>1 Q So you said if the plant sources were</p> <p>2 negative, then we could disregard it. Are you</p> <p>3 disregarding studies that show no association?</p> <p>4 MR. NIGH: Object to form,</p> <p>5 mischaracterizes testimony.</p> <p>6 THE WITNESS: No, but what I meant to</p> <p>7 say is that if the plant source was also -- was</p> <p>8 showing a negative association, we could say</p> <p>9 that NDMA in the study does not show a link.</p> <p>10 But -- but it -- but it does show a link from</p> <p>11 plants and not animals. So we can't totally</p> <p>12 disregard it because of that reason.</p> <p>13 BY MR. GALLAGHER:</p> <p>14 Q Okay. Is it possible that there's</p> <p>15 some unmeasured confounding factor for those who are</p> <p>16 getting NDMA from plant sources that explains the</p> <p>17 inconsistency in this data?</p> <p>18 A I mean, I can't think of a measured</p> <p>19 confounder that only affects plant users, but I</p> <p>20 mean, I don't know. I -- I wouldn't speculate.</p> <p>21 Q Is it possible that there's some</p> <p>22 factor for which there's an interaction with NDMA</p> <p>23 that those who are -- have a diet higher in plant</p> <p>24 sources than NDMA have -- that hasn't been measured</p> <p>25 here, and that's creating the inconsistency in the</p>
<p style="text-align: right;">Page 206</p> <p>1 It's just like, you know, getting</p> <p>2 protein from dairy or from meat. Once it's</p> <p>3 broken down to its amino acids, it's -- it's</p> <p>4 protein in the body. It does what it's</p> <p>5 supposed to do.</p> <p>6 BY MR. GALLAGHER:</p> <p>7 Q Okay. Do you have any explanation for</p> <p>8 why they might observe from plant sources NDMA, a</p> <p>9 hazard ratio of 1.93, but for NDMA generally and</p> <p>10 NDMA from animal sources, there's no evidence of</p> <p>11 association?</p> <p>12 A I -- I don't. But again, I think that</p> <p>13 it -- I mean, it is a piece of evidence that should</p> <p>14 be looked at in -- in -- in the grand scheme of all</p> <p>15 the evidence. And that's why I did talk about it in</p> <p>16 my report. I mentioned that no association with</p> <p>17 animal studies -- with the animal sources, but also</p> <p>18 did mention with the plant sources.</p> <p>19 So I think it's one piece of the</p> <p>20 puzzle that should be -- should be looked at. If --</p> <p>21 if the plant source was also a negative, then I</p> <p>22 would say we can disregard it. But since the plant</p> <p>23 source does show a signal and maybe we can't really</p> <p>24 explain why. But we can't really disregard the</p> <p>25 signal.</p>	<p style="text-align: right;">Page 208</p> <p>1 results?</p> <p>2 A I mean, I -- that's the next -- I</p> <p>3 don't -- again, I don't want to speculate. It's not</p> <p>4 really within my expertise to -- to opine on.</p> <p>5 Q Okay. So getting back to your report</p> <p>6 with respect to pancreatic cancer, as we talked</p> <p>7 about on Pages 19 and 20, you cite to the Fritschi</p> <p>8 article?</p> <p>9 A Yes.</p> <p>10 Q Which reported no association of</p> <p>11 nitrosamines and pancreatic cancer.</p> <p>12 You cite to the Straif article, which</p> <p>13 again found no evidence of an association between</p> <p>14 nitrosamines --</p> <p>15 A Again, just to clarify, Straif was</p> <p>16 inconclusive because of a very small number of</p> <p>17 cases. And Fritschi, I do explain the limitations</p> <p>18 in my report.</p> <p>19 Q Right. Okay. But neither of those --</p> <p>20 neither of those are supportive -- are evidence for</p> <p>21 an association of NDMA with pancreatic cancer,</p> <p>22 right?</p> <p>23 A Correct.</p> <p>24 Q And then you cite the Hidajat study,</p> <p>25 which we have discussed previously, right?</p>

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<p>1 A Yes.</p> <p>2 Q And then the Zheng study, which we've</p> <p>3 just looked at, for NDMA generally, is showing no</p> <p>4 evidence of an association of NDMA and pancreatic</p> <p>5 cancer, right?</p> <p>6 A For general NDMA, yes.</p> <p>7 Q Okay. So you've cited four articles.</p> <p>8 Three of them have no evidence for an association.</p> <p>9 One of them where the mechanism -- method of</p> <p>10 exposure was through inhalation or skin contact more</p> <p>11 than oral.</p> <p>12 And it's essentially on the basis of</p> <p>13 that -- that one study that you're concluding the</p> <p>14 dietary and occupational evidence demonstrates an</p> <p>15 increase in the risk of NDMA and NDEA with</p> <p>16 pancreatic cancer, right?</p> <p>17 A Yes. So I say the -- so I say the</p> <p>18 constellation of animal studies, the -- the large</p> <p>19 occupational studies that probably has a higher rate</p> <p>20 in terms of methodology and one increased risk of</p> <p>21 NDMA plant-based on one study. I'm kind of looking</p> <p>22 at the totality of the evidence for that.</p> <p>23 THE COURT REPORTER: Counsel, I'm</p> <p>24 sorry. I need to just -- I need to take one</p> <p>25 minute.</p>	<p>1 Hold on. Let me make my objection,</p> <p>2 please.</p> <p>3 Object to form, and mischaracterizes</p> <p>4 testimony.</p> <p>5 THE WITNESS: So totality doesn't mean</p> <p>6 just looking at what -- how many positive</p> <p>7 studies you have and how many negative studies</p> <p>8 you have. First of all, I -- I included three</p> <p>9 negative studies because they included my --</p> <p>10 they met my search criteria in my report. And</p> <p>11 so I had to talk about them, and I -- they were</p> <p>12 negative, and I had to talk about the</p> <p>13 limitations.</p> <p>14 And one of those three studies is</p> <p>15 Straif that -- that you mentioned, could not --</p> <p>16 with 15 cases, could not really study the</p> <p>17 question. So it wasn't really a negative</p> <p>18 study. It wasn't a well-designed study that</p> <p>19 led to a negative results. It was a very small</p> <p>20 study that could not answer the question.</p> <p>21 Fritschi also combined different</p> <p>22 exposures. I talked about the limitations of</p> <p>23 that study. And the -- when I say totality,</p> <p>24 yes, I believe that the study by Hidajat</p> <p>25 carries more of the weight because it was very</p>
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<p>1 MR. GALLAGHER: Okay. Can we go off</p> <p>2 the record?</p> <p>3 THE VIDEOGRAPHER: The time is now</p> <p>4 3:02. We're going off the record.</p> <p>5 (Whereupon, a short break was taken.)</p> <p>6 THE VIDEOGRAPHER: The time is now</p> <p>7 3:03. We're back on the record.</p> <p>8 Mr. Gallagher, I think you're on mute.</p> <p>9 MR. GALLAGHER: Sorry. Thank you.</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q Dr. Etminan, I want to explore this</p> <p>12 concept of totality of evidence with you.</p> <p>13 A Okay.</p> <p>14 Q So with -- with respect to pancreatic</p> <p>15 cancer, you have cited to three studies that show no</p> <p>16 evidence of an association of NDMA with pancreatic</p> <p>17 cancer. And you cite to one article again where the</p> <p>18 method of exposure was primarily inhalation or skin</p> <p>19 contact, not oral.</p> <p>20 And based on that one study, you're</p> <p>21 telling us that the totality of evidence is</p> <p>22 supportive of an association of exposure to NDMA and</p> <p>23 the risk for pancreatic cancer; is that right?</p> <p>24 A So --</p> <p>25 MR. NIGH: Object to form.</p>	<p>1 long follow-up, good sample size. Yes, it</p> <p>2 wasn't oral NDMA. I don't think we could ever</p> <p>3 have an oral -- orally-based NDMA exposure</p> <p>4 study that's well designed and can follow</p> <p>5 patients for a long time. I think logistically</p> <p>6 and ethically, that's impossible.</p> <p>7 But the -- over time, the data that we</p> <p>8 have from animal studies and other data over</p> <p>9 time, exposure to skin and lungs can lead to</p> <p>10 systemic absorption of NDMA.</p> <p>11 So to answer your question, it is not</p> <p>12 just three negative, one positive, I decided on</p> <p>13 the positive. It's -- it's the quality of the</p> <p>14 event. It's the weight of the evidence that</p> <p>15 goes into that decision.</p> <p>16 BY MR. GALLAGHER:</p> <p>17 Q Well, wouldn't the dietary studies be</p> <p>18 looking at oral -- oral exposure to NDMA to the</p> <p>19 extent they're being based on assumptions of the</p> <p>20 estimates for the amount of NDMA in particular</p> <p>21 foods?</p> <p>22 A Yes, they do. But, again, they also</p> <p>23 have limitations that, for example, Hidajat did not.</p> <p>24 And then most of their limitation would be -- that's</p> <p>25 why potentially it's that some of them are negative</p>

<p style="text-align: right;">Page 213</p> <p>1 is the -- the follow-up was not as long as Hidajat  2 to -- for -- to allow cancers to form.  3 And they did not control for competing  4 deaths or deaths of other causes. So if somebody  5 died of a heart attack, they were out of the study.  6 They could not get cancer. That would lead to a  7 smaller number of cancer cases.  8 So, yes, the dietary studies may --  9 may mimic -- may better mimic the valsartan  10 scenario, but they -- they have other limitations  11 that -- that may prevent them from showing a -- you  12 know, an effect -- an increase in risk with NDMA and  13 cancer.  14 Q Okay. Understanding that the dietary  15 studies do have limitations, and I think we had  16 discussed some of those earlier today, one of the --  17 one of the limitations of Hidajat study is that the  18 method of exposure -- strike that.  19 With respect to assessing exposure to  20 NDMA from valsartan, which would be oral, one of the  21 limitations of the Hidajat studies as a -- as a  22 basis for evaluating that question, is that the  23 method of exposure is primarily inhalation or direct  24 contact with skin, not oral exposure, right?  25 A Yes, I think we talked about it.</p>	<p style="text-align: right;">Page 215</p> <p>1 BY MR. GALLAGHER:  2 Q In your report, you focus on the upper  3 bound of that confidence interval. I want to talk  4 for a minute about the lower bound of the confidence  5 interval, 0.77.  6 So the -- according to this data, it  7 would be the -- the likelihood of the actual  8 relative risk being 0.77 is as good as the  9 possibility that the actual relative risk is 1.68.  10 Do I understand that right?  11 A I -- I don't -- I don't think I agree  12 with that. But I do agree that it's -- and you can  13 say it's an inconclusive result. I don't know if  14 the probability of getting .77 is the same. I mean,  15 it could be similar. It could be a bit -- I  16 can't -- that's a technical statistical question. I  17 can't -- I have to, kind of, maybe, go back and look  18 at it.  19 But for the purposes of our  20 discussion, I'm comfortable in saying that it's --  21 because it goes from very low to very high, that  22 it's inconclusive. But, again, if it went from very  23 low to, let's say, 1.2, 1.3, I would be more  24 comfortable saying it's negative. But because it's  25 going all the way up to 1.68, I'm more comfortable</p>
<p style="text-align: right;">Page 214</p> <p>1 Q Okay. Moving on in your report to  2 head and neck cancers?  3 A Okay.  4 Q So the first -- the first study cited  5 here is Loh, L-o-h.  6 A All right.  7 Q And for this, the observed relative  8 risk is 1.13; is that correct?  9 A Yes.  10 Q And this is exhibit -- the article is  11 Exhibit 15, if you want to look at it. But at the  12 moment, we can just look at Page 20 of your report.  13 A Okay.  14 Q So you agree that that was not  15 statistically significant evidence for an  16 association of NDMA and esophageal cancer, right?  17 A Yes.  18 Q Okay. And the confidence interval is  19 from 0.77 to 1.68, right?  20 A Yes. And, again, we have talked about  21 imprecision and the very low and very high limits  22 and what that means. But, yes --  23 THE COURT REPORTER: But, yes, what?  24 THE WITNESS: It wasn't statistically  25 significant.</p>	<p style="text-align: right;">Page 216</p> <p>1 in saying it's inconclusive.  2 MR. NIGH: And I would object to the  3 form of that last question.  4 BY MR. GALLAGHER:  5 Q If we look at Exhibit 15, the Loh  6 study, turning to Page 1057, I believe, just below  7 Table 2 --  8 A Yes.  9 Q -- on the left-hand side?  10 A Table 2, okay.  11 Q Yeah. Sorry, just below -- just below  12 Table 2.  13 A Okay.  14 Q And this is -- these studies are  15 evaluating multiple cancers. So this is carrying  16 over from the prior page where they say, "There was  17 no significant association with esophageal and  18 stomach cancers for all three exposures."  19 Do you see that?  20 A Which -- which -- are you looking at a  21 table or --  22 Q No. I'm sorry. I'm looking just  23 below the table.  24 A Below Table 2?  25 Q Yes. And it's -- it's going from</p>

<p style="text-align: right;">Page 217</p> <p>1 the -- the sentence starts at the end of Page 1056,  2 the prior page and carries over to Page 1057.  3 A Yeah. I mean, I -- I think that's  4 also reflected in Table 5. But in Table 5, they  5 also -- they also show the number of cases, and as I  6 mentioned before, with 55 cases of esophageal  7 cancer, that does not give you a very precise  8 estimate. So, yeah, it's not statistically  9 significant because it's probably not supposed to be  10 this small number of cases.  11 Q And the small number of cases is due  12 in part because relatively few people in this cohort  13 actually got -- actually had esophageal cancer,  14 right?  15 A Well, again, from the table, it seems,  16 like, compared to the other types of cancer, they --  17 this group had a smaller -- you know, had a smaller  18 number of cases. I'm not sure what the percentage  19 would be. I don't think they -- they have that as  20 to the percentage of patients in this study who had  21 esophageal cancer. But we just have the number of  22 esophageal cancers from the total number of cancers,  23 and it seems to be low.  24 Q Let's look at -- have we already  25 marked the Kefzei article? Exhibit 16, the Kefzei,</p>	<p style="text-align: right;">Page 219</p> <p>1 BY MR. GALLAGHER:  2 Q Okay. That potential for  3 misclassification applies as equally for esophageal  4 cancer as it does for gastric cancer, right?  5 MR. NIGH: Form objection.  6 THE WITNESS: It does, but, usually  7 misclassification that affects both groups,  8 usually, gives no results, which we got for  9 stomach cancer. Here, we have, you know, a  10 statistically significant increase in risk.  11 So, again, there has to be a very  12 clear mechanism as to how misclassification is  13 causing this increase in risk where --  14 esophageal because usually misclassification  15 that's non-differential just dilutes the  16 effect, which we --  17 THE COURT REPORTER: Between what?  18 THE WITNESS: Dilutes the effect. But  19 here, we do see a slight increase in risk  20 with -- in Kefzei with esophageal cancer.  21 BY MR. GALLAGHER:  22 Q Well, but you don't know if -- if  23 there's inaccurate reporting, either inaccurate  24 recording by the study subjects of what their actual  25 dietary intake is, or inaccurate assumptions about</p>
<p style="text-align: right;">Page 218</p> <p>1 article. And you're citing to this on Page 21 of  2 your report, with respect to --  3 A Please hold on.  4 Q Okay.  5 A Okay.  6 Q Again, now the -- the observed hazard  7 ratio is 1.15, right?  8 A For which cancer? Are you looking at  9 a specific table?  10 Q Oh, I'm sorry. The -- I'm looking at  11 your report. And you're more than welcome to look  12 at it.  13 A 1.15, yes.  14 Q For esophageal cancer?  15 A Uh-huh.  16 Q You had earlier -- when you were  17 discussing Keszei with respect to gastric cancer?  18 A Yes.  19 Q You had criticized this article  20 because of potential misclassification and  21 inaccurate reporting the different food intake by  22 the subjects. Do you remember that?  23 MR. NIGH: Form objection.  24 THE WITNESS: Yes.  25</p>	<p style="text-align: right;">Page 220</p> <p>1 the estimates of what the actual content of NDMA is  2 in each of the specific foods?  3 MR. NIGH: Form objection.  4 BY MR. GALLAGHER:  5 Q The data is going to be inaccurate.  6 You don't know what -- what the effect is going to  7 be.  8 MR. NIGH: Is that the end of the  9 question?  10 MR. GALLAGHER: Yes.  11 MR. NIGH: Form objection.  12 THE WITNESS: Yeah. We -- we don't  13 know. And, again, I'm just saying,  14 misclassification of a questionnaire would  15 usually lead to null -- or null results. And  16 we don't know what could have happened here.  17 They're different subjects.  18 The other -- the other potential  19 possibility is that, again, more of the -- I'm  20 just making this -- I'm making this inference  21 based on epi study design and the data. It's  22 possible that more of the cancer patients  23 with -- stomach cancer patients -- I'm sorry.  24 More of the patients who were followed died  25 before they got stomach cancer versus the --</p>

<p style="text-align: right;">Page 221</p> <p>1 those who got esophageal cancer probably could  2 have survived longer to get esophageal cancer.  3 So these are just sort of inferential  4 possibilities based on the data and their study  5 design that they present.  6 BY MR. GALLAGHER:  7 Q You have no basis, though, for  8 suggesting -- for saying that the -- the people who  9 ultimately got esophageal cancer just survived  10 longer than the people who got gastric cancer?  11 MR. NIGH: Form objection.  12 THE WITNESS: Again, we don't have --  13 we are not privy to any of this data. But from  14 the -- from the fact that they followed these  15 patients and looked at three related cancers,  16 they don't talk about how many died and dropped  17 out and any control for competing, you know,  18 events, such as death, and making an  19 inferential sort of suggestion that these could  20 be possibilities. Yes, of course, I don't  21 know. I don't think anybody would know unless  22 you actually had access to the data and  23 could -- you know, could analyze the data and  24 ask more questions.  25</p>	<p style="text-align: right;">Page 223</p> <p>1 actually is a confounder for -- for esophageal and  2 stomach cancers. And that's why it could fit that  3 unmeasured confounder scenario that I show, you  4 know, what happens if you have that unmeasured  5 confounder and how much -- how strong that  6 confounder has to be to make the results known.  7 So in a way, I did simulate for it --  8 but it was -- it was not controlled for in the  9 study.  10 Q Okay. And the same for -- for  11 smoking. The Straif study didn't control for  12 smoking, right?  13 A The -- the Hidajat study simulated --  14 Q That wasn't my question.  15 My question was the Straif study  16 didn't control for smoking, right?  17 A The Straif study --  18 MR. NIGH: Hold on. If you can please  19 not interrupt the witness. I don't know if he  20 finished that last question -- answer, but  21 please don't interrupt him going forward.  22 You can answer, Doctor.  23 THE WITNESS: No. I think I have  24 finished my question. Let me just pull Straif  25 again because you --</p>
<p style="text-align: right;">Page 222</p> <p>1 BY MR. GALLAGHER:  2 Q Okay. And then in your -- in your  3 report, again on Page 21, you go on and discuss the  4 Straif study and the Hidajat study, right?  5 A Yes.  6 Q Neither of those studies controlled  7 for alcohol use, correct?  8 A No. But, again, my analysis for one  9 unmeasured confounder, which could be alcohol,  10 showed -- with using the E-value that we talked  11 about earlier, showed that the effect of that one  12 unmeasured confounder, that could be alcohol, has to  13 be very large to make the results, you know, not --  14 you know, take the results to 1, basically.  15 So they did not -- they did not  16 control for alcohol in their study. But, again, I'm  17 using a simulation. I have shown that one  18 unmeasured confounder would not have changed the  19 results.  20 Q Okay. Well, alcohol is a strong risk  21 factor for cancer of the pharynx, larynx and  22 esophagus, right?  23 A Right. And, again, remember, based on  24 our discussion, the risk factor is not as  25 detrimental as a confounder. In this case, it</p>	<p style="text-align: right;">Page 224</p> <p>1 BY MR. GALLAGHER:  2 Q Sure. Yup.  3 A So the Straif did not adjust for  4 smoking. But again, the main problem with Straif  5 was with 15 cases, even if they had smoking, it  6 wouldn't have done anything because you have so --  7 small number of cases that, I mean, controlling for  8 smoking would be a moot point within the data, to  9 move the needle, if you will.  10 Q Okay. And the Hidajat study, as we  11 discussed, did not directly control for smoking,  12 correct?  13 A They did not directly control, but  14 they simulated smoking data in their study.  15 Q Okay. So now we have just talked  16 about two factors that haven't been accounted for in  17 these studies. In your --  18 A I -- I -- I sort of disagree with  19 that.  20 I -- when you simulate smoking data  21 and see if that changes the results or not, that  22 is -- I mean, that is not -- it may not be the same  23 as having the variable, but it -- it does -- I mean,  24 you have to give it some weight. If it doesn't  25 change your results, you can't just say, you know,</p>



<p style="text-align: right;">Page 225</p> <p>1 they didn't control for it.</p> <p>2 Q Okay. Well, they haven't adjusted</p> <p>3 for --</p> <p>4 A They didn't have the --</p> <p>5 Q None of these studies adjusted for --</p> <p>6 A Right.</p> <p>7 THE COURT REPORTER: I'm sorry.</p> <p>8 Adjusted for what?</p> <p>9 MR. GALLAGHER: Alcohol use or tobacco</p> <p>10 use.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q And just a minute ago, you were</p> <p>13 referring to this E-value methodology?</p> <p>14 A Yes.</p> <p>15 Q Magnitude of an unmeasured variable to</p> <p>16 reverse the risk, right?</p> <p>17 A Yes.</p> <p>18 Q What if there's two unmeasured</p> <p>19 variables?</p> <p>20 A This methodology only works with one.</p> <p>21 It only works for one unmeasured confounder.</p> <p>22 Q Okay. So it does -- it doesn't work</p> <p>23 if there's multiple unmeasured confounders?</p> <p>24 A It does not, but, again, when you talk</p> <p>25 about confounders, as I talked about earlier -- I</p>	<p style="text-align: right;">Page 227</p> <p>1 and risk of head and neck cancers, right?</p> <p>2 A It found an increased risk, a</p> <p>3 1.37 relative risk that was not statistically</p> <p>4 significant.</p> <p>5 Q Okay. Okay. Talking for a minute</p> <p>6 about when you're doing -- looking at data from an</p> <p>7 observational study, in theory, if there's no</p> <p>8 association between the exposure and the outcome,</p> <p>9 the relative risk is 1.0, right?</p> <p>10 MR. NIGH: Form objection.</p> <p>11 THE WITNESS: Yes, that's possible.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Well, is it possible, or is that --</p> <p>14 A I mean, no. That -- that scenario --</p> <p>15 that scenario is possible that you could have -- you</p> <p>16 could have no association in a study with a relative</p> <p>17 risk of 1.0.</p> <p>18 Q Okay. I'm -- if -- if -- by</p> <p>19 definition, if there's no association between an</p> <p>20 exposure and an outcome, the relative risk is 1.0?</p> <p>21 MR. NIGH: Object to form.</p> <p>22 THE WITNESS: Yes.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q Okay. And if the relative -- if, in</p> <p>25 fact, the exposure is protective against having the</p>
<p style="text-align: right;">Page 226</p> <p>1 mean, alcohol use in gastric cancer and -- and in</p> <p>2 this question is a true confounder.</p> <p>3 But there may be other variables that</p> <p>4 may look like a confounder. They may not be actual</p> <p>5 confounders. And the fact that they're not</p> <p>6 controlled for does not necessarily mean that had</p> <p>7 they been present, they would have changed the</p> <p>8 results, again, because you could have a classic</p> <p>9 confounder. But if the prevalence of that</p> <p>10 confounder is very low or its association with the</p> <p>11 outcome and the exposure is very low, it may not</p> <p>12 affect the results at all.</p> <p>13 So I think it's a bit premature to say</p> <p>14 I don't want to believe these results because they</p> <p>15 didn't control for these unmeasured confounders.</p> <p>16 It's something to think about and sort of factor in,</p> <p>17 but I think there are caveats to it.</p> <p>18 Q Okay. And then moving on in your</p> <p>19 report, you also address the Knekt study?</p> <p>20 A Yes.</p> <p>21 Q Do you see that towards the bottom on</p> <p>22 Page 21?</p> <p>23 And you would agree with me that Knekt</p> <p>24 did -- did not find statistically significant</p> <p>25 evidence of an association between exposure to NDMA</p>	<p style="text-align: right;">Page 228</p> <p>1 outcome, the relative -- the actual relative risk is</p> <p>2 below 1, correct?</p> <p>3 A Yeah, yes.</p> <p>4 MR. NIGH: Form objection.</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q And if the -- if there's a positive</p> <p>7 association between the exposure and the outcome,</p> <p>8 the relative risk, the actual relative risk, is</p> <p>9 above 1, right?</p> <p>10 MR. NIGH: Form objection.</p> <p>11 THE WITNESS: Yes.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q In practice, when you're looking at</p> <p>14 data from an observational study, you would rarely</p> <p>15 observe data where the observed relative risk is</p> <p>16 exactly 1.0, correct?</p> <p>17 MR. NIGH: Object to form.</p> <p>18 THE WITNESS: I mean, because I read a</p> <p>19 lot of papers, I have -- I wouldn't say it's</p> <p>20 that rare. I mean, it happens.</p> <p>21 BY MR. GALLAGHER:</p> <p>22 Q Sure. It can happen, but observation</p> <p>23 of a relative risk of data where the measured</p> <p>24 relative risk is above 1 does not mean there is an</p> <p>25 association, right?</p>

<p style="text-align: right;">Page 229</p> <p>1 MR. NIGH: Object to form.</p> <p>2 THE WITNESS: Again, you are -- you're</p> <p>3 only looking at a very small piece of the very</p> <p>4 large puzzle. I mean, one has to look at the</p> <p>5 methodology, the question, the study design,</p> <p>6 all the variables we've talked about today to</p> <p>7 be able to come up to that conclusion rather</p> <p>8 than just looking at the relative risk.</p> <p>9 BY MR. GALLAGHER:</p> <p>10 Q Okay. Moving on in your report on</p> <p>11 Page 22, Section 10.5 "Liver Cancer"?</p> <p>12 A Yeah.</p> <p>13 Q So, again, you criticize the Straif</p> <p>14 study as lacking the power to -- to examine the</p> <p>15 question, right?</p> <p>16 MR. NIGH: Form objection.</p> <p>17 THE WITNESS: Right.</p> <p>18 BY MR. GALLAGHER:</p> <p>19 Q And then you cite to the Hidajat</p> <p>20 study. That's the only other study that you cite</p> <p>21 to, right?</p> <p>22 A That's the only other study that has</p> <p>23 looked at liver cancer, you know, in a -- as a</p> <p>24 follow-up epidemiological study that my search --</p> <p>25 that I could find.</p>	<p style="text-align: right;">Page 231</p> <p>1 exposure; is that right?</p> <p>2 MR. NIGH: Form objection. Do you</p> <p>3 mean epi studies or animal studies or all</p> <p>4 studies?</p> <p>5 BY MR. GALLAGHER:</p> <p>6 Q You're not aware of any other studies</p> <p>7 in humans with respect to evaluating risk of</p> <p>8 exposure to NDMA and occurrence of liver cancer,</p> <p>9 right?</p> <p>10 MR. NIGH: Form objection.</p> <p>11 THE WITNESS: I'm not aware of any</p> <p>12 human studies that met my inclusion criteria,</p> <p>13 which required, again, measurement of NDMA and</p> <p>14 demonstration of the effect size, pretty much</p> <p>15 everything I have in my inclusion criteria. I</p> <p>16 could not find a human study that would fit</p> <p>17 those criteria that I could include in my</p> <p>18 report.</p> <p>19 BY MR. GALLAGHER:</p> <p>20 Q Okay. And so you don't have -- you</p> <p>21 don't have any studies that you're relying on that</p> <p>22 are evaluating oral exposure to NDMA and risk of</p> <p>23 liver cancer, correct?</p> <p>24 A No.</p> <p>25 Q Okay. Moving on, Section 10.6 of your</p>
<p style="text-align: right;">Page 230</p> <p>1 Q All right. In your report on Page 22,</p> <p>2 in the Section 10.5, you don't reach any conclusions</p> <p>3 about the risk of liver cancer through NDMA</p> <p>4 exposure, right?</p> <p>5 MR. NIGH: Form objection.</p> <p>6 THE WITNESS: Can you repeat the</p> <p>7 question?</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q In your report, in Section 10.5 on</p> <p>10 Page 22 of your report --</p> <p>11 A Right.</p> <p>12 Q You don't reach any conclusions about</p> <p>13 the risk of liver cancer through NDMA exposure at</p> <p>14 the end of your discussion like you do for the --</p> <p>15 A If you mean -- if you mean -- if you</p> <p>16 mean I don't have, like, a bolded summary, I -- I</p> <p>17 think it was just missed because I do have it for</p> <p>18 all the other sections. But, I mean, I do say at</p> <p>19 the very last sentence that, "To date, the study by</p> <p>20 Hidajat provides the strongest evidence on the risk</p> <p>21 of liver cancer."</p> <p>22 Q Okay. And you -- you don't have any</p> <p>23 other studies that -- you don't -- there are -- as</p> <p>24 far as you're aware, there aren't other studies</p> <p>25 evaluating the risk of liver cancer from NDMA</p>	<p style="text-align: right;">Page 232</p> <p>1 report which is looking at bladder cancer?</p> <p>2 A That's right.</p> <p>3 MR. GALLAGHER: Can we mark another</p> <p>4 Jakszyn article as Exhibit 21? And this is the</p> <p>5 Jakszyn article, J-a-k-s-z-y-n, Reference 48</p> <p>6 that you're citing to on Page 22?</p> <p>7 THE WITNESS: Right.</p> <p>8 (Whereupon, Exhibit 21 was marked for</p> <p>9 Identification.)</p> <p>10 MR. GALLAGHER: So let me know when</p> <p>11 that gets pulled up.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Do you see it there yet?</p> <p>14 A I'm here, yeah.</p> <p>15 Q Okay. So in this article -- or in</p> <p>16 this study, this study found no overall association</p> <p>17 between exogenous NDMA intake and bladder cancer,</p> <p>18 right?</p> <p>19 A No.</p> <p>20 Q So the observed relative risk was</p> <p>21 1.12, right?</p> <p>22 A That's right.</p> <p>23 Q And the confidence interval was 0.88</p> <p>24 to 1.4, right?</p> <p>25 A Yes.</p>

<p style="text-align: right;">Page 233</p> <p>1 Q So there's no evidence from this study</p> <p>2 of any association between NDMA exposure and bladder</p> <p>3 cancer, right?</p> <p>4 MR. NIGH: Form objection.</p> <p>5 THE WITNESS: I -- I do present some</p> <p>6 of the limitations of the study, but from the</p> <p>7 numbers that you cited and that I present, no.</p> <p>8 BY MR. GALLAGHER:</p> <p>9 Q Okay. And then back to your report,</p> <p>10 again, you look at the Straif study, right?</p> <p>11 A Yes.</p> <p>12 Q You cite to the Straif study, and</p> <p>13 there was no evidence or association between</p> <p>14 nitrosamines and bladder cancer, right?</p> <p>15 A Right.</p> <p>16 Q And then you cite to the Hidajat study</p> <p>17 in support of your opinions with respect to bladder</p> <p>18 cancer, right?</p> <p>19 A That's right.</p> <p>20 Q And you don't have -- those are the</p> <p>21 three studies on which your opinion with respect to</p> <p>22 bladder cancer is based, right?</p> <p>23 A Yes.</p> <p>24 Q And of those three studies, Hidajat</p> <p>25 was the only one where there was an observation of a</p>	<p style="text-align: right;">Page 235</p> <p>1 but that doesn't mean that the -- that the potential</p> <p>2 biases in the study that it -- that precluded the</p> <p>3 study from showing an effect. So in other words,</p> <p>4 it's not a -- it's not a very tight confidence</p> <p>5 interval coming from the very well-designed study.</p> <p>6 So you can't just look at the</p> <p>7 precision. You have to put it into context of</p> <p>8 the -- what are the potential limitations of this</p> <p>9 study that could have led to this nonsignificant</p> <p>10 result.</p> <p>11 Q Okay. You criticize the Loh study</p> <p>12 because it doesn't adjust for previous history of</p> <p>13 prostate cancer, right?</p> <p>14 A Well, that's one of the criticisms.</p> <p>15 One other criticism is that they also said that</p> <p>16 overall in the population that NDMA levels is</p> <p>17 relatively low to other populations. They didn't</p> <p>18 look at high versus low NDMA, so -- so yeah, so</p> <p>19 those are the limitations.</p> <p>20 Q Okay. The Hidajat study did not</p> <p>21 adjust for previous history of prostate cancer,</p> <p>22 right?</p> <p>23 A It did not, but since it showed</p> <p>24 again -- because it showed a statistically -- an</p> <p>25 increase in risk, that that potential confounding</p>
<p style="text-align: right;">Page 234</p> <p>1 relative risk that -- that reached statistical</p> <p>2 significance, correct?</p> <p>3 A Correct.</p> <p>4 Q Okay.</p> <p>5 Moving on. On Page 23 of your report,</p> <p>6 you're looking at prostate cancer.</p> <p>7 A Right.</p> <p>8 Q Okay. So -- and, again, the first</p> <p>9 study you refer to is the Loh study, right?</p> <p>10 A Right.</p> <p>11 Q And that study, there was not a</p> <p>12 statistically significant -- not a statistically</p> <p>13 significant observation for any association of NDMA</p> <p>14 exposure with prostate cancer, right?</p> <p>15 A That's right.</p> <p>16 Q In fact, the relative risk was 1.01,</p> <p>17 right?</p> <p>18 A Correct.</p> <p>19 Q The lower bound of the 95 percent</p> <p>20 confidence interval is 0.90, and the upper bound was</p> <p>21 1.13, right?</p> <p>22 A Yes.</p> <p>23 Q Would you consider that confidence</p> <p>24 interval precise?</p> <p>25 A The confidence interval is precise,</p>	<p style="text-align: right;">Page 236</p> <p>1 effect of previous history of prostate cancer has to</p> <p>2 be quite prevalent in that large population, has to</p> <p>3 affect one group more than the other. So, again,</p> <p>4 just absence of or not adjusting for a non-measured</p> <p>5 confounder doesn't necessarily mean that had it been</p> <p>6 included that the results would have been different.</p> <p>7 So here I'm just mentioning it as one</p> <p>8 limitation. But in Hidajat, because they did find</p> <p>9 the signal, I think one has to have -- has to put</p> <p>10 this into perspective, but in a different Hidajat</p> <p>11 versus Loh.</p> <p>12 Q So you -- if it's -- if it's not</p> <p>13 adjusted for and it's an unmeasured confounder, you</p> <p>14 don't know what the effect is, right?</p> <p>15 A We don't know what the effect is, but</p> <p>16 we know that the -- that the unmeasured confounder</p> <p>17 changes the results when -- when certain conditions</p> <p>18 are present. So if let's say, yes, they didn't</p> <p>19 adjust for Hidajat for previous history of prostate</p> <p>20 cancer, but let's say only .5 percent of the</p> <p>21 population of these men had previous history,</p> <p>22 because of that low number, adjusting or not</p> <p>23 adjusting, because of that low prevalence, would</p> <p>24 probably not have changed the results of the study.</p> <p>25 So, again, unmeasured confounders</p>

<p style="text-align: right;">Page 237</p> <p>1 changed the results of studies if -- you know, based  2 on a number of other factors, the prevalence, their  3 strength of association to the outcome and to the  4 exposure.  5 Q Well, if -- if the -- if the  6 prevalence of prior history of prostate cancer was  7 that low in the population, it also wouldn't have  8 changed the results of the Loh study, right?  9 MR. NIGH: Object to form.  10 THE WITNESS: No, it wouldn't, but  11 again, I'm not -- I'm kind of mentioning a  12 number of limitations and potential limitations  13 for why Loh has that, you know, pardon the pun,  14 low relative risk, not just unmeasured  15 confounders.  16 BY MR. GALLAGHER:  17 Q Okay. I understand. But --  18 A Yeah.  19 Q All right. Hidajat has the same  20 limitation.  21 MR. NIGH: Form objection.  22 BY MR. GALLAGHER:  23 Q Correct?  24 A Hidajat, yes. Hidajat does have the  25 same limitation, but Hidajat found an increase in</p>	<p style="text-align: right;">Page 239</p> <p>1 Q Okay.  2 THE WITNESS: Can we have a ten-minute  3 break and come back at 4?  4 MR. GALLAGHER: Sure.  5 THE VIDEOGRAPHER: The time is now  6 3:50. This ends Media Unit Number 5. We're  7 going off the record.  8 (Whereupon, a short break was taken.)  9 THE VIDEOGRAPHER: The time is now  10 4:01. This begins Media Unit Number 6. We're  11 back on the record.  12 BY MR. GALLAGHER:  13 Q Welcome back, Dr. Etminan.  14 A Thank you.  15 Q Looking again at your report on  16 Page 23.  17 A Okay.  18 Q And I'm gonna -- you'll be happy to  19 know I'm going to move ahead to the next section,  20 10.8: "Blood Cancers."  21 A Okay.  22 Q So you cite a study by Richardson,  23 right?  24 A Yes.  25 Q And Richardson is --</p>
<p style="text-align: right;">Page 238</p> <p>1 risk. And unmeasured -- and the effect of an  2 unmeasured confounder has to be more profound to  3 change that result.  4 Here, as we said, the unmeasured  5 confounder may have been less of an issue because of  6 the results. However, it is still a limitation that  7 I thought I should include because, again, we don't  8 really know, you know, have all the numbers from  9 this study. We don't know, was it collected or not,  10 or how it would have changed the results.  11 Q Sure. And you agree that we should  12 acknowledge the limitations of studies regardless of  13 if the result was there was an association or not an  14 association?  15 MR. NIGH: Form objection.  16 THE WITNESS: Yes. But I mean,  17 limitations have -- I don't -- I don't think we  18 can paint all limitations with the same brush.  19 There are some limitations that would not be  20 that detrimental. There are limitations that  21 would be.  22 So generally speaking, your -- I agree  23 with your statement, but at the same time, I  24 think there could be caveats and nuances on  25 that statement.</p>	<p style="text-align: right;">Page 240</p> <p>1 MR. GALLAGHER: Well, why don't we go  2 ahead and mark it as the next exhibit. Are we  3 up to 23 now?  4 (Whereupon, Exhibit 22 was marked for  5 Identification.)  6 MR. GALLAGHER: Okay. This is going  7 to be -- the Richardson article will be  8 Exhibit 22.  9 BY MR. GALLAGHER:  10 Q Let me know when that shows up in the  11 chat, Dr. Etminan.  12 A Okay. So I have it.  13 Q Okay. The title of this article is  14 "Occupational Risk Factors for Non-Hodgkin's  15 Lymphoma: A Population Based Case Control Study in  16 Northern Germany," right?  17 A That's right.  18 Q So this is an occupational study,  19 right?  20 A Right.  21 Q And the -- you looked at this study  22 and the odds ratio for exposure to nitrites,  23 nitrates or nitrosamine, all three combined in terms  24 of the risk factor for lymphoma, right?  25 A Yes.</p>

<p style="text-align: right;">Page 241</p> <p>1 Q In this study, they didn't -- in this 2 study, they didn't even try to separate out NDMA 3 separately, right? 4 A I don't know if they couldn't or 5 didn't try. It wasn't separated. 6 Q Okay. But regardless of if they 7 couldn't or didn't try or tried and it didn't work, 8 the data that you're relying on is looking at 9 exposure of -- exposure to nitrites, nitrates and 10 nitrosamine all together, right? 11 MR. NIGH: Form objection. 12 THE WITNESS: Right. 13 BY MR. GALLAGHER: 14 Q And so you're not going to be able to 15 separate out the specific impact of -- from this 16 study, specific impact for NDMA risk for lymphoma, 17 right? 18 A No, not specifically for NDMA. 19 Q You then look at the Straif study -- 20 or you cite to the Straif study again. And 21 you're -- this is back in your report on Page 23? 22 A Uh-huh. 23 Q Right? 24 A Yes. 25 Q And -- and you have the same criticism</p>	<p style="text-align: right;">Page 243</p> <p>1 MR. NIGH: Form objection. 2 BY MR. GALLAGHER: 3 Q Moving on to Section 10.9 of your 4 report on Page 24, which is "Lung Cancer"? 5 A Okay. 6 Q So, for lung cancer, you cite to a 7 De Stefani article? 8 A Uh-huh. 9 Q Right? 10 A Is there an exhibit? 11 Q It's a 2009 article that you cited to. 12 That's what Citation Number 44 is. 13 A Right. Are you going to upload it, or 14 am I just going to look at it here? 15 MR. GALLAGHER: Can we go ahead and 16 mark that. 17 (Whereupon, Exhibit 23 was marked for 18 Identification.) 19 MR. GALLAGHER: So that's Exhibit 23, 20 and I'm also going to mark now as Exhibit 24 a 21 De Stefani article from 1998. 22 (Whereupon, Exhibit 24 was marked for 23 Identification.) 24 BY MR. GALLAGHER: 25 Q Do you have Exhibit 23 in front of</p>
<p style="text-align: right;">Page 242</p> <p>1 for Straif, that it was underpowered as you have 2 for -- for other of the cancers, right? 3 A Yes. 4 Q But regardless, Straif does not 5 provide evidence for an association of exposure to 6 NDMA and occurrence of blood cancers, right? 7 A Let me just look at Straif again 8 before I -- I mean, they had -- they had a small 9 number of cases. They looked at nitrosamines. I 10 mean, similar in structure, but not NDMA, per se. 11 And they -- I mean, there was an increase in risk 12 with lymphoma but not significant because of small 13 number of cases. 14 Q Next -- and then you cite again to the 15 Hidajat study, right? 16 A Right. 17 Q And you're looking at the data from 18 Hidajat for lymphoma, leukemia and multiple myeloma, 19 right? 20 A Right. 21 Q So really, Hidajat is the only study 22 that you're citing to in support of your opinion 23 with respect to exposure to NDMA and any association 24 with blood cancers, right? 25 A Right.</p>	<p style="text-align: right;">Page 244</p> <p>1 you? 2 A Yes. 3 Q Okay. This -- this study was looking 4 at meat intake and risk of lung cancer; is that 5 right? 6 A I just want to note, make sure that 7 this is the one that I cite. 8 Q Okay. We had some confusion there to, 9 so that's why I'm going to pull up the other one. 10 A The meat intake one, I don't think it 11 provided NDMA levels. I don't think that I used 12 that. I think I used the other one. 13 Q Okay. If you look in your report, 14 looking at Page 24, under "Lung Cancer," you say, "A 15 study by De Stefani examined the risk of lung cancer 16 among subjects exposed to different levels of NDMA 17 through diet." 18 Do you see that, right? 19 A Right. I think that should be another 20 De Stefani. It probably got mixed up. 21 Q Okay. But if we go to -- 22 A If we go to the '96 article. 23 Q Okay. But if we go to Page 38 of -- 24 of your report, listing the references? 25 A Uh-huh.</p>



<p style="text-align: right;">Page 245</p> <p>1 Q The -- Reference 44 you're citing to  2 this article "Meat Intake, Meat Mutagens and Risk of  3 Lung Cancer in Uruguayan Men."  4 THE COURT REPORTER: I'm sorry. I'm  5 sorry. Excuse me.  6 MR. GALLAGHER: Do you need me to  7 repeat the question with it?  8 THE COURT REPORTER: No.  9 MR. GALLAGHER: Do you need  10 Dr. Etminan to repeat his answer?  11 THE COURT REPORTER: Yes.  12 BY MR. GALLAGHER:  13 Q I'll repeat the question.  14 So Dr. Etminan, here in your report,  15 Reference 44 is this De Stefani article from 2009  16 titled, "Meat Intake, Meat Mutagens and Risk of Lung  17 Cancer in Uruguayan Men," right?  18 A Right. And I believe that that should  19 actually be another -- should be replaced by another  20 De Stefani. It got mixed up, some so the De Stefani  21 data that I included is from the De Stefani '96 in  22 "Cancer Epidemiology" --  23 THE COURT REPORTER: What markers?  24 THE WITNESS: "Cancer Epidemiology  25 Biomarkers and Prevention."</p>	<p style="text-align: right;">Page 247</p> <p>1 Q Okay. And the title of this -- this  2 is an older article than Exhibit 23 that we were  3 just looking at, right?  4 A That's right.  5 Q And this is entitled, "Dietary  6 Nitrosodimethylamine and the Risk of Lung Cancer: A  7 Case Control Study from Uruguay," right?  8 A That's right.  9 Q Okay. So this -- this was a dietary  10 study, right?  11 A Yes.  12 Q And this is subject to the same  13 limitations of the other dietary studies that we've  14 talked about in terms of -- errors in filling out  15 the dietary questionnaire would be one, right?  16 A Well, again, dietary questionnaires,  17 usually, the error is differential --  18 non-differential -- pardon me, non-differential.  19 Here they do show a risk, but it is a dietary  20 questionnaire study. So generally speaking, it  21 could have limitations, but I don't -- I mean, I  22 can't even think of a specific reason why the -- a  23 specific reason as to why they put limitations in  24 terms of the questionnaire would, you know, would  25 affect the results. But generally speaking, all</p>
<p style="text-align: right;">Page 246</p> <p>1 THE COURT REPORTER: Thank you.  2 BY MR. GALLAGHER:  3 Q But you agree with me that this 2009  4 article does not separately evaluate levels of NDMA,  5 right?  6 A Right.  7 Q Okay.  8 MR. GALLAGHER: We'll mark as  9 Exhibit 24 a 1996 De Stefani article. Let me  10 know when that shows up in your chat.  11 THE WITNESS: Sorry. That should be  12 De Stefani 2000 -- is it -- exhibit which  13 number?  14 BY MR. GALLAGHER:  15 Q Exhibit 24. It should be coming  16 shortly.  17 A Right. 24, okay.  18 Q Have you got it?  19 A Yes.  20 Q Okay. So is this -- this is the  21 article that you meant to refer to?  22 A Yes.  23 Q That's in Reference 44 from your  24 report?  25 A Yes.</p>	<p style="text-align: right;">Page 248</p> <p>1 dietary studies could have --  2 THE COURT REPORTER: Could have what?  3 THE WITNESS: Limitations.  4 THE COURT REPORTER: Thank you.  5 BY MR. GALLAGHER:  6 Q Okay. And this is a case control  7 study, correct?  8 A Yeah. Yeah.  9 Q Would you consider this a  10 retrospective study?  11 A Yes.  12 Q Is there a potential for recall bias  13 for the dietary questionnaire?  14 A There could be. In all dietary  15 studies that's a possibility.  16 Q Okay. And is a part of -- a part of  17 what leads to that recall bias could be that the  18 cases for those with lung cancer feel more invested  19 in identifying what the -- what led to their  20 diagnosis, whereas the controls are not in the -- in  21 the same type of a situation, right?  22 THE COURT REPORTER: I'm sorry. What  23 was the objection?  24 MR. NIGH: Form objection.  25 THE COURT REPORTER: And was there an</p>

<p style="text-align: right;">Page 249</p> <p>1 answer?</p> <p>2 THE WITNESS: I said that it's</p> <p>3 possible.</p> <p>4 BY MR. GALLAGHER:</p> <p>5 Q Okay. Moving on in your report, you</p> <p>6 next cite to a study by Goodman?</p> <p>7 A Yes.</p> <p>8 Q One more thing. Back in your report,</p> <p>9 when you're discussing the De Stefani article --</p> <p>10 MR. GALLAGHER: If we can highlight</p> <p>11 that section. Yup.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q And you talk about, "The study</p> <p>14 identified 320 cases of lung cancer and matched them</p> <p>15 to 320 controls," right?</p> <p>16 A Yeah.</p> <p>17 Q And -- and then you say, "After</p> <p>18 adjusting for important confounding variables,</p> <p>19 including pack-years of smoking and history of lung</p> <p>20 cancer," and you go on to talk about the data.</p> <p>21 A Uh-huh.</p> <p>22 Q So you agree that smoking and past</p> <p>23 history of cancer are important confounding</p> <p>24 variables, right?</p> <p>25 A Yes. And if you have the data, if</p>	<p style="text-align: right;">Page 251</p> <p>1 any one given confounding variable -- actually,</p> <p>2 unmeasured confounding variable, actually did bias</p> <p>3 the results, right?</p> <p>4 MR. NIGH: Form objection.</p> <p>5 THE WITNESS: Exactly and precisely,</p> <p>6 no, unless you have the data.</p> <p>7 BY MR. GALLAGHER:</p> <p>8 Q Okay. And when you have multiple</p> <p>9 unmeasured confounding variables, that just</p> <p>10 complicates it even more in terms of whether one or</p> <p>11 more of those multiple unmeasured confounding</p> <p>12 variables actually bias the results, right?</p> <p>13 MR. NIGH: Form objection.</p> <p>14 THE WITNESS: If -- if those -- a lot</p> <p>15 of times, these variables that, you know, are</p> <p>16 mentioned as confounders are not true</p> <p>17 confounders. They are risk factors as we</p> <p>18 talked about it. So in -- in a situation of</p> <p>19 risk factors, I -- I don't think again, lack of</p> <p>20 measuring for a risk factor only affects the</p> <p>21 precision around the effect size. It --</p> <p>22 usually minimally, doesn't change the</p> <p>23 direction. So to answer your question, yes,</p> <p>24 but a lot of times, these are not really</p> <p>25 unmeasured confounders. They are just risk</p>
<p style="text-align: right;">Page 250</p> <p>1 you -- have the data available, it should be</p> <p>2 adjusted for. I think what we talked about, in a</p> <p>3 different sort of context, today is that lack of an</p> <p>4 unmeasured confounder doesn't always mean that the</p> <p>5 results would be biased. But if you have a</p> <p>6 confounder that is important and it's been</p> <p>7 collected, then by all means, it should be --</p> <p>8 THE COURT REPORTER: It should be</p> <p>9 what?</p> <p>10 THE WITNESS: Controlled for.</p> <p>11 BY MR. GALLAGHER:</p> <p>12 Q And so for studies that don't control</p> <p>13 for these important confounding variables, that is a</p> <p>14 limitation of those studies, right?</p> <p>15 A It is a limitation, but again, we</p> <p>16 have -- we have sort of techniques, too, that we can</p> <p>17 use to simulate the data and see how it affects --</p> <p>18 it would affect the results. And it is a</p> <p>19 limitation, but it does not necessarily mean that</p> <p>20 the study should not be believed in. Because, as</p> <p>21 I -- as I mentioned a number of times, a lack of an</p> <p>22 unmeasured confounder doesn't always lead to, you</p> <p>23 know, biased results. It depends on a number of</p> <p>24 criteria and situations on the confounding.</p> <p>25 Q Right. But you don't know if -- if</p>	<p style="text-align: right;">Page 252</p> <p>1 factors. Yeah.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Okay. Moving on in your report, now</p> <p>4 you cite to a study by Goodman?</p> <p>5 A Yes.</p> <p>6 MR. GALLAGHER: And let's go ahead and</p> <p>7 mark this. This is going to be Exhibit 25.</p> <p>8 Let me know when you have it.</p> <p>9 (Whereupon, Exhibit 25 was marked for</p> <p>10 Identification.)</p> <p>11 THE WITNESS: I have it.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q So this article, Exhibit 25, is</p> <p>14 titled, "High Fat Foods and the Risk of Lung</p> <p>15 Cancer," right?</p> <p>16 A Yes.</p> <p>17 Q So this study is focusing on the</p> <p>18 effect of dietary cholesterol and dietary fat on</p> <p>19 lung cancer risk, right?</p> <p>20 THE COURT REPORTER: And dietary what?</p> <p>21 MR. GALLAGHER: Dietary fat.</p> <p>22 THE WITNESS: Okay.</p> <p>23 BY MR. GALLAGHER:</p> <p>24 Q And this was a diet history survey,</p> <p>25 right?</p>

<p style="text-align: right;">Page 253</p> <p>1 A Yes.</p> <p>2 Q And, in fact, in almost -- this is a</p> <p>3 diet history survey, and do you understand that --</p> <p>4 so in terms of a diet history survey, that's</p> <p>5 different from a food frequency questionnaire; is</p> <p>6 that right?</p> <p>7 MR. NIGH: Form objection.</p> <p>8 THE WITNESS: Let me just -- can I</p> <p>9 just read it for a few minutes?</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q Sure.</p> <p>12 MR. GALLAGHER: Can we go off the</p> <p>13 record for a minute while he -- to give him</p> <p>14 time to review?</p> <p>15 THE VIDEOGRAPHER: The time is now</p> <p>16 4:25. We're going off the record.</p> <p>17 (Whereupon, a short break was taken.)</p> <p>18 THE VIDEOGRAPHER: The time is now</p> <p>19 4:27. We're back on the record.</p> <p>20 BY MR. GALLAGHER:</p> <p>21 Q Okay. So this -- this study uses diet</p> <p>22 history survey, right?</p> <p>23 A Yes.</p> <p>24 Q Okay. And, in fact, in -- in many</p> <p>25 instances, the subject of the study wasn't</p>	<p style="text-align: right;">Page 255</p> <p>1 cases, but only 7 percent of the controls, right?</p> <p>2 A Right.</p> <p>3 Q So there's an unequal -- there's an</p> <p>4 unequal distribution of surrogate interviews for the</p> <p>5 cases versus for the controls, right?</p> <p>6 A Right. But you're -- I think you're</p> <p>7 automatically assuming that the unequal distribution</p> <p>8 leads to, say, again, measurement error on the part</p> <p>9 of the cases. And we -- we don't know if that's the</p> <p>10 case. I mean, it could, in fact, because it's --</p> <p>11 Q Sure.</p> <p>12 A -- it could actually improve accuracy.</p> <p>13 We don't know. All we know is that there is a</p> <p>14 difference in percentage of those who used the</p> <p>15 surrogate versus those who didn't.</p> <p>16 Q Okay. So we have already talked about</p> <p>17 one of the -- and it's just an inherent limitation</p> <p>18 of dietary studies, is the potential for</p> <p>19 inaccurately reporting in terms of foods that the</p> <p>20 subject does eat, the food frequency.</p> <p>21 A Generally speaking, yes --</p> <p>22 MR. NIGH: Hold on. Form objection.</p> <p>23 Form objection.</p> <p>24 Go ahead. You can answer.</p> <p>25 THE WITNESS: Generally speaking, I</p>
<p style="text-align: right;">Page 254</p> <p>1 available, and so they actually used -- did an</p> <p>2 interview with a surrogate in order to collect the</p> <p>3 historic information on diet history, right?</p> <p>4 Maybe -- go ahead.</p> <p>5 A Yes, I mean, in a lot of dietary</p> <p>6 studies, especially when the patients are elderly,</p> <p>7 it's usually a family member who helps to complete</p> <p>8 the questionnaire. So -- I don't think this is that</p> <p>9 much of a difference in, sort of, a step involving</p> <p>10 the survey versus other dietary questionnaires that</p> <p>11 we see.</p> <p>12 Q Okay. If we turn to Page 289 of the</p> <p>13 Goodman article?</p> <p>14 A Yes.</p> <p>15 Q And here, this is the section</p> <p>16 describing subjects and methods. On the left-hand</p> <p>17 side, the paragraph second from the bottom starts,</p> <p>18 "In some instances." And this is describing --</p> <p>19 A Yeah.</p> <p>20 Q -- why in some circumstances they</p> <p>21 obtained surrogate interviews from the spouse or</p> <p>22 next of kin, right?</p> <p>23 A Yeah.</p> <p>24 Q And for this study, surrogate</p> <p>25 interviews were conducted for 29 percent of the</p>	<p style="text-align: right;">Page 256</p> <p>1 think it's -- we talked about this already.</p> <p>2 BY MR. GALLAGHER:</p> <p>3 Q Okay. And there certainly is a</p> <p>4 possibility that a surrogate will have a different</p> <p>5 level of accuracy than the subject themselves in</p> <p>6 recalling foods that the subject has -- has</p> <p>7 typically eaten, correct?</p> <p>8 MR. NIGH: Form objection.</p> <p>9 THE WITNESS: It's -- it's possible.</p> <p>10 BY MR. GALLAGHER:</p> <p>11 Q And especially where the -- the</p> <p>12 percentage of surrogate interviews for the cases is</p> <p>13 different from the percentage of surrogate</p> <p>14 interviews for the controls. Any difference in</p> <p>15 accuracy of the surrogates and the actual subjects,</p> <p>16 both see the data, right?</p> <p>17 MR. NIGH: Form objection.</p> <p>18 THE WITNESS: Again, if you're</p> <p>19 assuming that there are measurement errors with</p> <p>20 the cases versus the controls. If that would</p> <p>21 be the case, then, yes.</p> <p>22 BY MR. GALLAGHER:</p> <p>23 Q Okay. And just to be clear, I'm not</p> <p>24 just asking about differences in recall of cases</p> <p>25 versus controls.</p>

<p style="text-align: right;">Page 257</p> <p>1 I'm asking about, there can be  2 differences in -- in recall of foods that were  3 typical in a person's diet if the person answering  4 the question is the subject themselves versus if the  5 person answering the questions is a surrogate for  6 the subject, right?  7 A Yes.  8 Q Back to your report on Page 24, the  9 second paragraph of "Lung Cancer," that is referring  10 to the Goodman study.  11 A Uh-huh.  12 Q So after discussing the odds ratio,  13 you say, "One limitation of Goodman is that it is  14 unclear how duration of exposure to nitrosamines was  15 assessed."  16 Do you see that?  17 A Yes.  18 Q You agree with me that duration of  19 exposure to nitrosamine is a factor that has to be  20 considered in terms of evaluating them if there's  21 any potential risk factor, right?  22 A Yes. And, again, that's why I'm  23 also -- in forming my opinion, I'm also relying on  24 the Hidajat study, which measured NDMA exposure  25 through inhalation, which would have a direct effect</p>	<p style="text-align: right;">Page 259</p> <p>1 and the upper bound goes to greater than 1.  2 That's what they call imprecise.  3 If it's -- if it's some sort of skew  4 to the right from 1.1 or higher, as it is in  5 this case, we wouldn't say that's imprecise.  6 BY MR. GALLAGHER:  7 Q Okay. Well, if there's no  8 association, you would expect the confidence  9 interval to go below 1 and above 1, correct?  10 A I'm sorry. Can you clarify the  11 question?  12 Q If there's no association between the  13 exposure and the outcome, you would expect the  14 confidence interval, the lower bound to be below 1  15 and the upper bound to be above 1, correct?  16 A Well, that's -- again, I think we  17 talked about this. So that would be an  18 inconclusive. I wouldn't say no association. If  19 the effect size is greater than 1, but the  20 confidence intervals are as wide as you just  21 mentioned, that would be an inconclusive sort of a  22 result rather than no association.  23 Q Okay. I guess, I didn't say the  24 confidence intervals were wide. I just said if  25 there's no association, you would expect the lower</p>
<p style="text-align: right;">Page 258</p> <p>1 in this specific -- for this specific cancer on the  2 lung.  3 Q Okay. And then in your report you  4 next cite to the Loh study, which we have looked at  5 and discussed previously. The Loh study reports a  6 relative risk of 1.05, a 95 percent confidence  7 interval of 0.88 to 1.24, correct?  8 A Yes.  9 Q So you would agree with me that the  10 Loh study does not provide evidence of an  11 association between NDMA exposure and risk of lung  12 cancer, right?  13 A Correct.  14 Q Okay. Going back to the odds ratios  15 for -- from the Goodman study, for the first one  16 which is intake of NDMA in men, the confidence  17 interval is 1.7 to 6.2, right?  18 A Yes.  19 Q Would you consider that confidence  20 interval to be imprecise?  21 MR. NIGH: Form objection.  22 THE WITNESS: No. Imprecise, we  23 usually mean imprecise when it crosses 1 and  24 goes beyond 1, and -- and -- so that the lower  25 bound goes from, say, minus 1 -- or minus 1,</p>	<p style="text-align: right;">Page 260</p> <p>1 bound of the confidence interval to be below 1 and  2 the upper bound of the confidence interval to be  3 above 1, right?  4 A Yes. So, again, what you're  5 portraying the confidence interval that's -- that  6 crosses 1. So it goes either way, and, again, that  7 fits the -- again, we don't have specific numbers  8 here. But that usually fits the definition of  9 imprecision or uncertain results, not necessarily  10 negative results, uncertain results. Or  11 inconclusive results.  12 Q Okay. If you had a study that was  13 extremely well-powered, and you -- you actually did  14 observe from the data a relative risk of 1.0, and  15 the confidence interval was 0.98 to 1.02, are you  16 telling me that you would consider that confidence  17 interval to be imprecise?  18 MR. NIGH: Form objection.  19 THE WITNESS: No. But, again, in your  20 example, you didn't -- you didn't specify  21 numbers with the numbers that you're -- you're  22 giving me now, which -- which seem to be very  23 tight. And, again, if -- if this is a  24 non-biased study, a perfectly designed study,  25 then that would be a no association.</p>

<p style="text-align: right;">Page 261</p> <p>1 BY MR. GALLAGHER:</p> <p>2 Q Okay. And so this discussion about</p> <p>3 imprecise confidence intervals are when it's -- the</p> <p>4 lower bound is below 1 and the upper bound is above</p> <p>5 1, that's not actually a measured determination of</p> <p>6 whether the confidence interval is precise or not,</p> <p>7 right?</p> <p>8 A Again, it -- it depends on the -- what</p> <p>9 the confidence interval is -- what the effect size</p> <p>10 is, and what the confidence interval is around that</p> <p>11 effect size. The example that you gave me fits your</p> <p>12 description, but if you have situations where you</p> <p>13 have, say, a relative risk of 4 and a very wide</p> <p>14 confidence interval, that does not -- that does not</p> <p>15 mean that there is no association. That means that</p> <p>16 that's an inconclusive study. So, again, I can't --</p> <p>17 at least, I can't come up with a cookie-cutter</p> <p>18 definition. It depends on what the effect size is,</p> <p>19 and what the confidence interval around the effect</p> <p>20 size is.</p> <p>21 Q Okay. You can't come up with a</p> <p>22 cookie-cutter definition, but are there -- are there</p> <p>23 some sort of standards around what you're</p> <p>24 considering to be an imprecise confidence interval</p> <p>25 versus a precise confidence interval?</p>	<p style="text-align: right;">Page 263</p> <p>1 A Yes.</p> <p>2 Q And as I think you just mentioned,</p> <p>3 there's perhaps some plausibility to why inhalation</p> <p>4 of something may have an impact that the lung --</p> <p>5 that oral ingestion would not, right?</p> <p>6 A Can you repeat that last question,</p> <p>7 please?</p> <p>8 Q Sure.</p> <p>9 I think you had referenced in one of</p> <p>10 your earlier answers that you can understand why</p> <p>11 inhalation of a substance could -- could have some</p> <p>12 sort of an impact on the lungs, right?</p> <p>13 A Yeah. I mean, inhaling a carcinogen</p> <p>14 would have probably more of a -- would -- would</p> <p>15 have -- would be able to impose more of its</p> <p>16 carcinogenic effect because it's directly affecting</p> <p>17 that organ. But eventually, it will be -- it will</p> <p>18 be absorbed systemically over time. It's just that</p> <p>19 the first organ its seeing is the lungs because it's</p> <p>20 going through inhalation. So it may affect the</p> <p>21 organ -- the lungs more, but over time, it will be</p> <p>22 systemically absorbed and affect potentially other</p> <p>23 parts of the body.</p> <p>24 Q Okay. And as we talked about, workers</p> <p>25 in rubber factories are not just inhaling NDMA.</p>
<p style="text-align: right;">Page 262</p> <p>1 A Yes, so again --</p> <p>2 MR. NIGH: Form objection.</p> <p>3 Go ahead. You can answer.</p> <p>4 THE WITNESS: If the relative risk of</p> <p>5 a study is 4 and the 95 confidence interval is</p> <p>6 from .3 to 15, that would be an inconclusive</p> <p>7 study. If the relative risk of the study is 4</p> <p>8 and the -- and the lower bound starts from 1.8</p> <p>9 to 6, that is not an imprecise study. That</p> <p>10 is -- that confidence interval, we call it a</p> <p>11 relatively tight confidence interval.</p> <p>12 BY MR. GALLAGHER:</p> <p>13 Q Okay. And then back to your report on</p> <p>14 Page 24, the next paragraph, you cite to the Hidajat</p> <p>15 study again, right?</p> <p>16 A Yes.</p> <p>17 Q And you cite to that, where the hazard</p> <p>18 ratio reported by Hidajat for exposure and NDMA</p> <p>19 having a potential association of lung cancer with</p> <p>20 the hazard ratio being 1.70, right?</p> <p>21 A Yes.</p> <p>22 Q And as we have discussed, the Hidajat</p> <p>23 study is an occupational study in the rubber</p> <p>24 industry in the UK where the exposure to NDMA was</p> <p>25 primarily through inhalation, not oral, right?</p>	<p style="text-align: right;">Page 264</p> <p>1 They're inhaling all sorts of things, including</p> <p>2 rubber dust, rubber fumes, benzene. There's all</p> <p>3 sorts of things that are --</p> <p>4 MR. NIGH: Hold on. I'd like to</p> <p>5 object here. This is about the 20th plus time</p> <p>6 that I've heard this same question, you know.</p> <p>7 I think there was an instruction not to be</p> <p>8 cumulative. We have been patient. We have let</p> <p>9 the cumulative questions come on multiple</p> <p>10 topics, but this is the point as to which it's</p> <p>11 becoming very much overly cumulative. It's the</p> <p>12 same question over and over on the same topic.</p> <p>13 And I could come up with probably 20 examples</p> <p>14 right now of the same question being asked.</p> <p>15 You know, at this point, I -- you</p> <p>16 know, I would caution the counsel that</p> <p>17 they're -- I think that counsel may be thinking</p> <p>18 they have 10 hours of record time. I do not</p> <p>19 believe that's the case. I think that there</p> <p>20 were strings that were attached and things that</p> <p>21 were said that -- you know, in terms of</p> <p>22 seven hours and when the exception may apply.</p> <p>23 And, frankly, I don't think that that exception</p> <p>24 is applied here.</p> <p>25 So, again, I would object. This has</p>



<p style="text-align: right;">Page 265</p> <p>1 become completely overly cumulative. And I  2 would rest on the federal rules of seven hours  3 saying that none of the exceptions have been  4 met for the judge's ruling on 10 hours in this  5 case.  6 You can answer.  7 THE WITNESS: Sorry. I forgot what  8 the question was.  9 MR. GALLAGHER: You know, I think the  10 judge was -- was very clear in his ruling that  11 we had 10 hours, and was equally as clear  12 during the Hecht deposition and unhappy when he  13 was bothered in the middle of dinner and the  14 deposition had not -- was not anywhere close  15 to -- to 10 hours. So moving on.  16 BY MR. GALLAGHER:  17 Q Dr. Etminan, on Section 11 in your  18 expert report?  19 A Yes.  20 Q This is addressing epidemiologic  21 studies of valsartan-containing NDMA and cancer,  22 right?  23 A Yes.  24 Q In these studies, they are actually  25 addressing the exposure -- well, let me step back</p>	<p style="text-align: right;">Page 267</p> <p>1 of impurity, right?  2 A They're not -- I disagree. They're  3 not -- they're not quantifying the NDMA valsartan.  4 They are only looking at valsartan tablets and  5 doses.  6 Q The exposure that they're evaluating  7 is -- so the title of the Pottegard study is "Use of  8 N-nitrosodimethylamine (NDMA) Contaminated Valsartan  9 Products and Risk of Cancer: Danish Nationwide  10 Cohort Study," right?  11 A That -- that is the title, but if you  12 read the study -- the exposure that we're here today  13 to talk about is NDMA and its risk of cancer, and so  14 the study should address the amount of NDMA in  15 valsartan and its risk with cancer. What it does,  16 though, is look at valsartan tablets that have some  17 NDMA in it, in them, we don't know how much.  18 And with respect to Pottegard, we --  19 we are not even sure if the -- the control valsartan  20 group didn't have NDMA in those formulations.  21 So there is definitely measurement  22 error going on in quantifying -- appropriately  23 quantifying NDMA in valsartan along with other  24 limitations.  25 Q Why do you say that there's definitely</p>
<p style="text-align: right;">Page 266</p> <p>1 for a minute.  2 MR. GALLAGHER: Let's mark as  3 Exhibit 26, the Pottegard study, and as  4 Exhibit 27 the Gomm, G-o-m-m, study.  5 (Whereupon, Exhibit 26 was marked for  6 Identification.)  7 (Whereupon, Exhibit 27 was marked for  8 Identification.)  9 BY MR. GALLAGHER:  10 Q Let me know when those two exhibits  11 show up, Exhibit 26 and 27.  12 THE WITNESS: Sorry. I got  13 disconnected and got reconnected. There is  14 nothing in the -- okay, I see it now.  15 BY MR. GALLAGHER:  16 Q Okay. You have Exhibit 26 as the  17 Pottegard study, right?  18 A Yeah.  19 Q And Exhibit 27 is that there also, the  20 Gomm study?  21 A I just got 26 for now. Yes.  22 Q So both of these studies are  23 evaluating the exposure that's actually at issue in  24 this litigation, right, which is exposure to  25 valsartan that contains some small amount of NDMA's</p>	<p style="text-align: right;">Page 268</p> <p>1 measurement error?  2 A Because NDMA levels vary in different  3 batches or different types of valsartan. But there  4 are many different generic valsartan products, and  5 they may have different levels of NDMA in them. So  6 higher levels may put somebody at a higher risk of  7 cancer, and this study did not look at that, which I  8 think is an important distinct that should be looked  9 at.  10 And also because the study was done  11 early on, it turns out that some of the control  12 group, which they -- they thought did not have NDMA  13 in them probably did have NDMA in them as well. So  14 there is again an error in measurement between the  15 two groups. So that is -- that is the limitation of  16 the, you know, measurement error portion of this  17 study.  18 Q Okay. So am I understanding right,  19 they would have to know the amount of NDMA that each  20 of the subjects was actually exposed to to evaluate  21 whether there actually is a risk of these cancers,  22 from that literature?  23 A They would have to -- they would have  24 to categorize -- have had to categorize the  25 different levels of -- hello?</p>

<p style="text-align: right;">Page 269</p> <p>1 MR. GALLAGHER: I can hear you. Does 2 somebody else need to mute, maybe? 3 THE WITNESS: Yeah, there's an echo. 4 They should have -- maybe they 5 couldn't, but the -- the right thing to do is 6 to categorize different NDMA levels in these 7 valsartan tablets and categorize them to say: 8 High, medium and low dose. And then follow 9 patients for more than the amount of time, I 10 think it's three years, I believe, that they 11 did, to make sure that they are at risk of 12 developing cancer. 13 And then also make sure that the 14 control group does not have any NDMA in 15 those -- in those batches. And they can also 16 make sure there's no switching going on, 17 because, again, patients take these drugs from 18 their pharmacy. And they don't really specify 19 which generic formulation they get. So there 20 could be switching between patients, and they 21 could be switching between the doses of NDMA 22 over time. So all of those limitations I think 23 probably led to the negative results. 24 BY MR. GALLAGHER: 25 Q Okay. You do agree with me that the</p>	<p style="text-align: right;">Page 271</p> <p>1 you have that now, Exhibit 27, I believe? 2 A Yes. 3 Q And you're addressing the Gomm study 4 on Page 26 of your report. From your perspective, 5 does the Gomm study, you know, essentially have, 6 from your perspective, the same limitations as we 7 just discussed for the Pottegard study? 8 A Yes, I would again -- 9 MR. NIGH: Hold on. Hold on. Let me 10 object. Form objection. 11 You can answer, Dr. Etminan. 12 THE WITNESS: Yes. Again, just like 13 Pottegard, there's no specification of the NDMA 14 content in the valsartan users, and I think 15 they actually say possible or probable 16 contamination. So there's a feeling of 17 uncertainty as to, you know, whether, say, for 18 example, the control group had any NDMA or did 19 not have any NDMA. There's no discussion of 20 what if people switch between the, you know, 21 different doses which could have had different 22 NDMA levels. 23 And then there is the problem of only 24 a three-year follow up, which for a cancer is 25 quite inadequate. And there's also some</p>
<p style="text-align: right;">Page 270</p> <p>1 Pottegard study reports a negative result in terms 2 of any association between exposure to NDMA as an 3 impurity in valsartan and -- 4 A Well, again, negative results with the 5 caveat of a number of limitations. 6 Q Okay. And among those -- among those 7 limitations that you've identified is the people 8 conducting the study would need to somehow quantify 9 the amount of NDMA to which the subjects were 10 actually exposed in order to evaluate that potential 11 association of exposure to NDMA as an impurity of 12 valsartan with cancer? 13 A Right. I make sure that those -- 14 those patients are taking these higher levels of 15 NDMA for at least a specific period of time to allow 16 the cancer process to sort of form and be diagnosed. 17 You know, if somebody takes the drug 18 for three months and then leaves the study, that -- 19 that is not a good follow up for this study. You 20 need long follow up. You need minimal switching. 21 You need specific NDMA dosing information for the 22 subjects, and you need to make sure that the control 23 group are all clean valsartan users, and there's no 24 NDMA in them as well. 25 Q Okay. Moving on to the Gomm study, do</p>	<p style="text-align: right;">Page 272</p> <p>1 evidence of selection bias as well. 2 BY MR. GALLAGHER: 3 Q Okay. And with respect to -- just 4 discussing -- discussing the limitation you have 5 identified of -- of time to follow up, you 6 understand that these -- these products were on the 7 market only relatively recently. So between 8 approximately 2014 and 2018, there's -- there's not, 9 at the moment, an opportunity for any longer follow 10 up, right? 11 MR. NIGH: Form objection. 12 THE WITNESS: Yes. I mean, that is 13 the problem. But that doesn't take away from 14 the fact that -- I mean, if you can't do this 15 study, you shouldn't do it. You should wait 16 until you have adequate follow up. You cannot 17 do sort of a -- you cannot disregard an 18 important part of this study design, which is 19 adequate follow up, because there just simply 20 isn't enough data. I mean, they could have 21 waited until more data is accumulated before 22 they actually did this study. 23 BY MR. GALLAGHER: 24 Q It's not that they necessarily 25 shouldn't do the study, but it's just acknowledging</p>

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1 that there's no other data. There's no longer term  
 2 follow up data that's available right now?  
 3 A Okay.  
 4 MR. GALLAGHER: I want to be sensitive  
 5 to the court reporter. We have been going for  
 6 an hour, when she asked that that be how far we  
 7 go, so can we -- can we go off the record now?  
 8 THE VIDEOGRAPHER: The time is now  
 9 4:59. We're going off the record. This ends  
 10 Media Unit Number 6.  
 11 (Whereupon, a short break was taken.)  
 12 (Whereupon, the deposition concluded  
 13 at 4:59 p.m.)  
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1 DEPOSITION REVIEW  
 2 CERTIFICATION OF WITNESS  
 3 ASSIGNMENT REFERENCE NO: 4772261  
 4 CASE NAME: Valsartan  
 5 DATE OF DEPOSITION: August 24, 2021  
 6 WITNESS: MAHYAR ETMINAN, Ph.D.  
 7 In accordance with the Rules of Civil  
 8 Procedure, I have read the entire transcript of my  
 9 testimony or it has been read to me.  
 10 I have listed my changes on the attached  
 11 Errata Sheet, listing page and line numbers as well  
 12 as the reason(s) for the change(s).  
 13 I request that these changes be entered as  
 14 part of the record of my testimony.  
 15 I have executed the Errata Sheet, as well  
 16 as this Certificate, and request and authorize that  
 17 both be appended to the transcript of my testimony  
 18 and be incorporated therein.  
 19  
 20 \_\_\_\_\_  
 21 Date Mahyar Etminan  
 22 Sworn to and subscribed before me, a  
 23 Notary Public in and for the State and County, the  
 24 referenced witness did personally appear and  
 25 acknowledge that:  
 26 They have read the transcript;  
 27 They have listed all of their corrections  
 28 in the appended Errata Sheet;  
 29 They signed the foregoing Sworn Statement;  
 30 and  
 31 Their execution of this Statement is of  
 32 their free act and deed.  
 33 I have affixed my name and official seal  
 34 this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.  
 35 \_\_\_\_\_  
 36 Notary Public  
 37 \_\_\_\_\_  
 38 Commission Expiration Date  
 39  
 40  
 41  
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 44  
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1 DEPOSITION ERRATA SHEET  
 2 Page Line From to  
 3 \_\_\_\_\_  
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 17 \_\_\_\_\_  
 18 \_\_\_\_\_  
 19 SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
 20 MAHYAR ETMINAN  
 21  
 22  
 23  
 24  
 25

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1 C E R T I F I C A T E  
 2  
 3 I, Jamie I. Moskowitz, a Shorthand  
 4 (Stenotype) Reporter and Notary Public, do hereby  
 5 certify that the foregoing Deposition, of the  
 6 witness, MAHYAR ETMINAN, taken at the time and place  
 7 aforesaid, is a true and correct transcription of my  
 8 shorthand notes.  
 9 I further certify that I am neither  
 10 counsel for nor related to any party to said action,  
 11 nor in any way interested in the result or outcome  
 12 thereof.  
 13 IN WITNESS WHEREOF, I have hereunto set  
 14 my hand this 1st day of September 2021  
 15  
 16 <%1154,Signature%>  
 17 Jamie Ilyse Moskowitz  
 18 License No. XI01658  
 19  
 20  
 21  
 22  
 23  
 24  
 25

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